THE CANADIAN MINING JOURNAL

L. 33 — TORONTO — SPECIAL QUEBEC ISSUE — No. 13

The Canadian Mining Journal: Room 36, Canadian Mortgage Building, 10 Adelaide Street East, Toronto

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Cost of power	28.50
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2—BC-26 Butterfly Valve tools used.

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Total cost of 3 ft. 6 inches advance with Hammer Drills	$62.47

Saving per day with Hammer Drills,	**$26.03**
Total cost per foot advance with Piston Drills	$25.28
Total cost per foot advance with Hammer Drills	17.85
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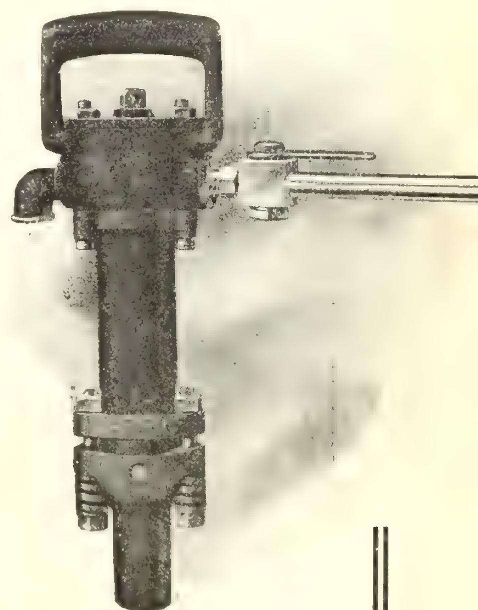

These figures are simply to substantiate remarks we have made before. They are actual records furnished us by the mine owners and were not made for the purpose of advertising.

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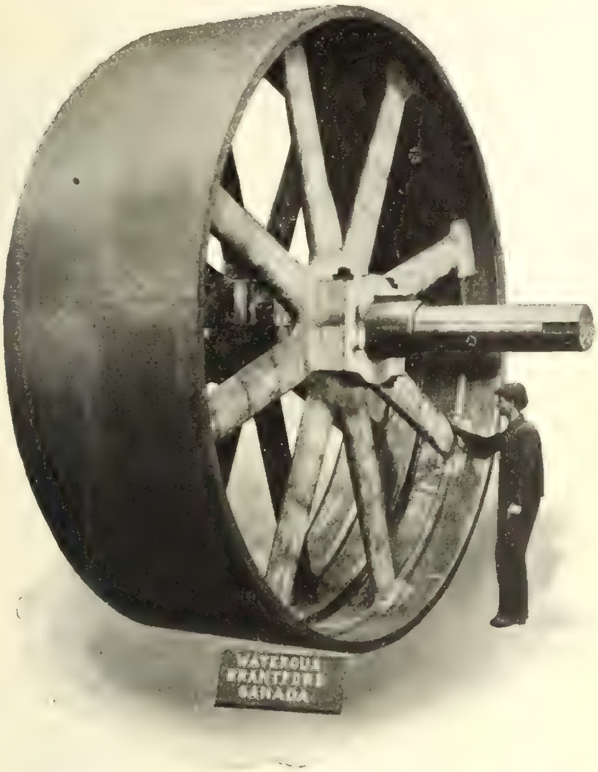

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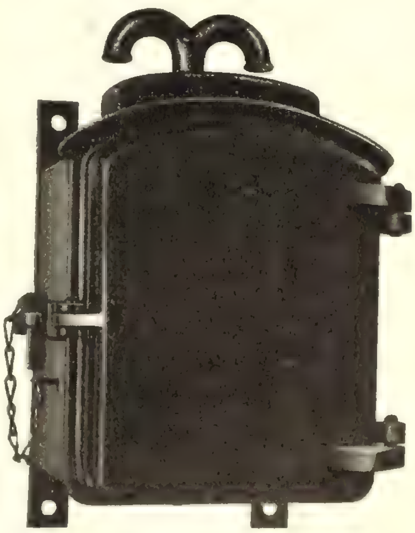

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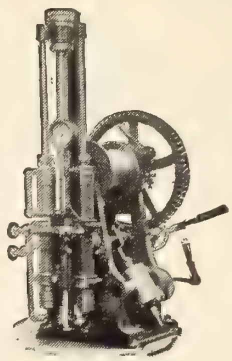

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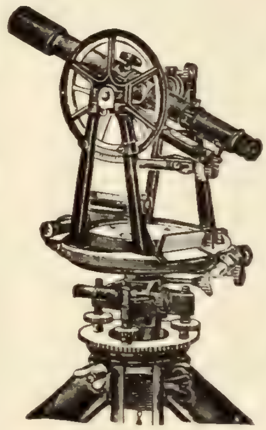

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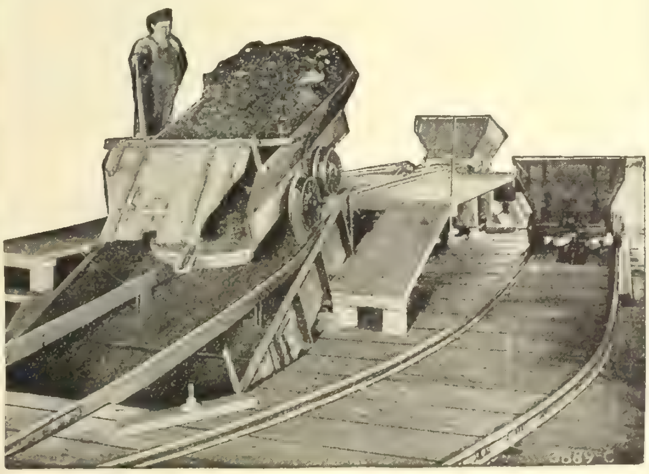

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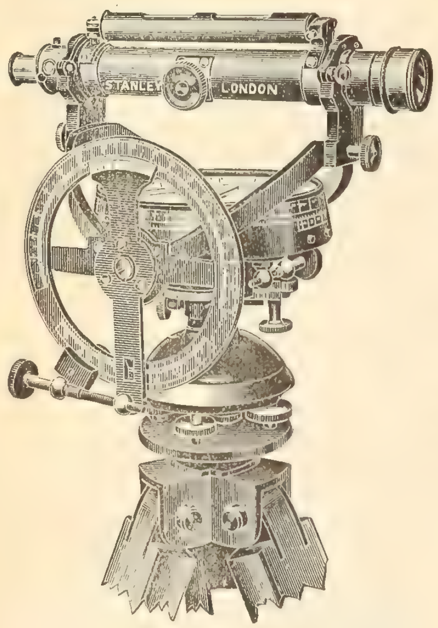

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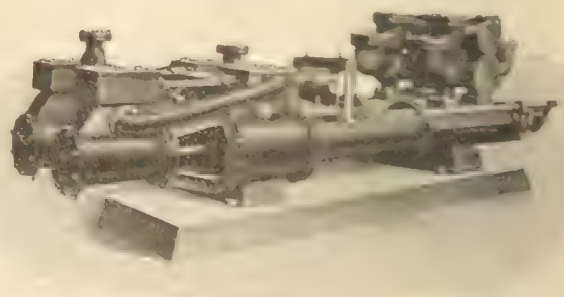

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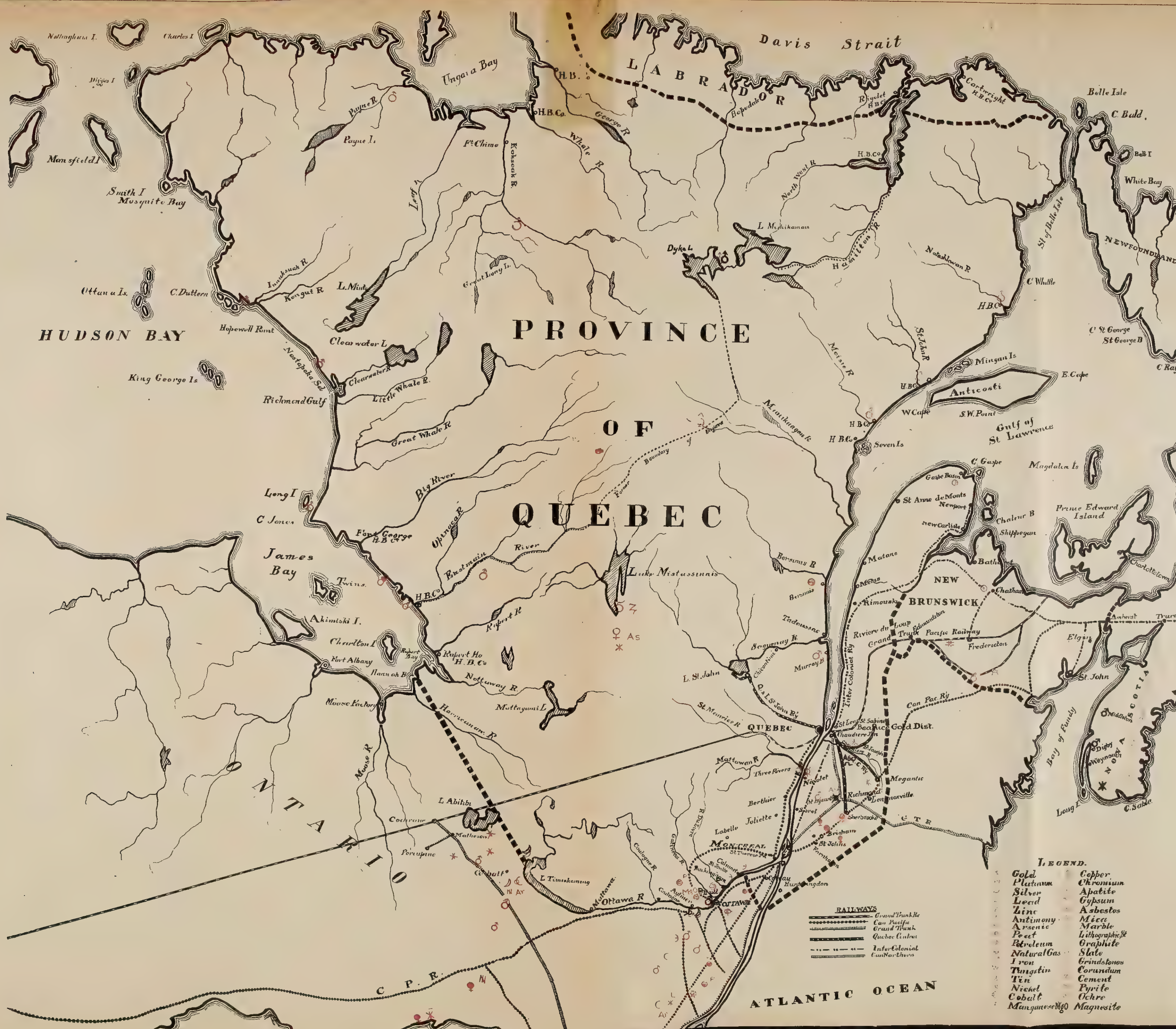
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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, July 1, 1912. No. 13

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"
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CIRCULATION.

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CONTENTS.

QUEBEC.

In publishing this special Quebec issue of **The Canadian Mining Journal** we have kept in view two objects. The first of these has been to bring to the attention of our readers the many unique openings that the Province offers to the investor. Therefore, we have given prominence to such enterprises as the mining and preparation of China clay, the utilization of titaniferous iron ore, the markets for mica and graphite, and the quarrying of magnesite and marble. While, of course, the asbestos industry is not overlooked, it is not featured strongly, the field of asbestos mining has been thoroughly exploited. In fact it has suffered from over-exploitation. Hence, we have not attempted to do more than present a careful summary of the present position of the industry.

Our second object is to impress the public with the fact that Province of Quebec is entering upon a new phase in its mining history. No spectacular "booms" like those of Rossland, Cobalt, and Porcupine, ever blessed or cursed Quebec. It has, in truth, been quite overshadowed by its sister Province, Ontario. The arbitrary line of division between the two Provinces has also formed more or less of a barrier to the prospector. In other words, Quebec has not been the fashion. Nevetheless, the commercial mining opportunities in Quebec are unexcelled. One branch of mining may be taken as an instance. The Weedon copper mine, operated by a United States company, from small beginnings, has developed into a mine of large promise. The region in which the Weedon is situated has for years been known. Outcrops of copper-bearing iron pyrites were discovered long before the Weedon (or McDonald) mine was opened. Had this discovery been made in Ontario, in all probability there would have been scores of prospectors on the spot in a very short time. Since, however, Quebec was the scene of the discovery, no special activity resulted. Fortunately it was that a group of New York mining investors happened to be looking round for a mining chance.

A brighter aspect of the situation is presented when minerals other than copper ores are considered. Canadian investors are interesting themselves in China clay, in graphite, in mica, and in other mineral products. The commercial possibilities of these commodities have not been considered until now. With easy access to a cosmopolitan shipping port like Montreal there should be no difficulty in bringing these ventures to a profitable stage of development.

The extraordinary facilities available in the settled portions of Quebec, particularly in the Eastern Town-

ships, are themselves a large inducement to the miner. Throughout several counties hydro-electric power is obtainable at very moderate rates, and the prospecting chances are excellent. Labour is not expensive. Supplies can be readily obtained. Hence with the marked advantages such as good transportation, equitable laws, and accessible markets, there is every reason to think that Quebec is the "real tip."

We quite realize that it is impossible to give specific directions to the investor, yet it is quite within the bounds of editorial propriety to suggest certain lines of activity. And our suggestions can be made without the least element of invidiousness. We are convinced that the investor who knows his business sufficiently well to employ a properly qualified engineer, need take less chances in Quebec than in any other part of the continent. We say this advisedly.

By the same token this remark applies to Eastern Ontario, to portions of British Columbia, and to large areas of Nova Scotia. The success of one company means much to any community. It also has its bearing upon analogous ventures in other parts of the Dominion. The Weedon mine, as an example, may be looked upon as the keynote of the mining situation in the Eastern Townships.

Apart, however, from the purely commercial phases of mining, there is much to be learned about all countries. Quebec in a sense is terra incognito to the public. It is our privilege to publish the first authentic series of articles dealing with the mineral resources of the province. We hope and believe that the information collected for this issue of **The Canadian Mining Journal** will prove acceptable to our readers. This special number is one of several that we intend to publish during the current year. Each Province will be given all warranted publicity.

It is our good fortune to have friends upon whom we may call. Dr. James Douglas, the Hon. Mr. Devlin, Mr. Theo. Denis, Mr. J. Obalski, Mr. John E. Hardman, Mr. Fritz Cirkel, Mr. James Ross, and several others have contributed to these columns. To them our hearty thanks are due. Each has willingly done his utmost to assist us. If from all the other Provinces of Canada we receive the same whole-hearted support that Quebec has given us we shall be fortunate indeed.

It is a matter of sincere regret that space limitations prevent us from publishing several very timely articles that have been submitted to us. These articles will appear in later issues, and will, we hope, lose nothing in not being included in this number. Their non-appearance is altogether a question of printer's exigencies.

A BRIEF HISTORICAL SKETCH OF GOLD AND COPPER MINING IN QUEBEC

Written for the Canadian Mining Journal by Dr. James Douglas

A historical sketch of Canadian mining should really begin with Jacques Cartier's mining for gold at Cap Rouge, and carrying back with him to France either some crystals of pyrites or flakes of mica, to be there disabused of the idea that all is gold that glitters. Talon, the great Intendant, sent Jolliette to confirm the Jesuit stories of native copper from the shores of Lake Superior. His enemies claimed that he was really promoting his friends' and his own dishonest traffic in furs under the guise of developing the national resources. How curiously history repeats itself!

The first real attempt to work the copper of Lake Superior was made at the instigation of the famous trapper, Henry. Unfortunately, Townsend, the Chancellor of the Exchequer, who framed the famous stamp act policy, lost money in the enterprise, and may thereby have been prejudiced against America, its people and its resources.

The only mining and smelting done under the French regime was on the bog ores of the St. Maurice. They continued to attract capital up to our own day. The story of their exploitation has been often and well told.

It was not until the close of the first half of the past century that there was any mining excitement in Canada. It was really started by the discovery of a nugget of gold on the Chaudiere River by a French girl, and the narration of her find by Captain Baddeley in Silliman's Journal. Some years elapsed, however, before any active gold washing was prosecuted on the tributaries of the Chaudiere. The greatest success was secured by a brother of Sir William Logan at the mouth of the Du Loup. The right to mine for gold was secured from Mr. De Lery, the seignior who had obtained a perpetual patent to mine for gold on his property, and transferred his rights to the Chaudiere Mining Co. It operated quite extensively, but unprofitably, on the gravels of the River Gilbert, or Tuffe de Pins. Subsequently the rights were secured by my father, Dr. James Douglas, but all work done was under license by the habitants themselves and particularly on the gravels from the bed of the Des Plantes stream. All these streams flowed into the Chaudiere from the west. The present hydraulic gravel washing on a large scale is on the River DesMeulles, which flows into the Chaudiere from the east. The banks of the Gilbert and the Des Plantes above usual water level were known to be auriferous in the early days, and in places the gravels were rich enough to be worked by the Long Tom and the cradle; but the quantity of gravel available was not at that time deemed great enough to warrant the introduction of hydraulicing on the Californian model.

The great quartz veins which are exposed at the Devil's Rapids in the Seigniory of St. Francois, and at the falls above the junction of the Chaudiere and the Du Loup, offered a tempting inducement to engage in quartz mining; but, although gold bearing, the average

value everywhere of the quartz veins was so low as to be prohibitory. The only mass of quartz with gold in paying quantities was one my father paid a reward to Pere Paulin of $500 for finding. It was an ingeniously manufactured sample.

But copper mining in the Province of Quebec soon over-shadowed the interest in gold mining. Attention was first drawn to the copper deposits by Sir William Logan in his report for 1847-48, as Director of the Canadian Geological Survey. The first active operations were almost immediately afterwards commenced in the township of Inverness, but the adjacent township of Leeds was the scene of the most active efforts to mine the small gash veins and the large beds of low grade ore in the slates of the Quebec group. The history of the three or four companies that have succeeded one another in attempting vainly to extract money out of the Harvey Hill deposits is not an encouraging inducement to a fifth company to undertake such a forlorn task. Yet at the same time, now that there is railroad connection with the mine, and ores of as low grade, though in more favourable rocks, for mining, are being profitably exploited in the West, with very high labour cost, it is possible that money might be made where money formerly was lost. The operations at Harvey Hill, under the English and Canadian Mining Co., were sufficiently attractive to induce almost innumerable other mines being opened, principally on smaller deposits in the Quebec Group of rocks. Dr. A. W. J. Wilson, in 1909, spoke of his being recently commissioned to examine 525 places in the Province in which some of the minerals carrying copper have been found at some time or other. During the same early days a famous mine at Acton was opened on limestone, probably of Cambrian age. It was an extremely rich mass of what to-day we would call secondary ores, which cropped out at surface, and was for a time very productive and very profitable, according to the standards of those days. The rich ores being exhausted, work was abandoned, but with the knowledge we now have of copper in limestones and shales in some of the Arizona copper districts, the rocks carrying this mysterious and once famous deposit should be carefully studied.

The only mine still working of these hundreds of failures is the sulphur-bearing Eustice mine near Sherbrooke. It was opened under a different name in those early days, where there were three companies operating on these sulphur deposits. The two mines most energetically worked were—one owned by the Hon. George Drummond, and the other by a Hartford company. At that time the ores were roasted in heaps and matted in small brick furnaces, whose life was about a week or ten days; and if a furnace could put through ten tons a day, it was looked on as a phenomenon. The general manager of the Hartford, however, appreciated the necessity of utilizing the sulphur, and small acid works were erected at St. Joseph, opposite Quebec, and acid there first made out of the Capelton ores and the residues leaded for copper. There was, however, no market for the acid, and this progressive action in the right direction failed, like so many others, because premature—a negative lesson in conservation.

MICA MINING IN THE PROVINCE OF QUEBEC*

Hugh. S. de Schmid, M. E.

The majority of the mica mines operated in Quebec Province (as also in other parts of Canada), are concerned with the extraction of phlogopite or amber mica. Few muscovite or white mica mines have ever been worked in Canada, and such have, as a rule, also produced feldspar as a by-product.

Muscovite.

The muscovite-bearing pegmatite dykes are found cutting (as a general rule conformably) normal gneiss at localities as far apart as the coast of Labrador and the Yellow Head Pass in the Rocky Mountains. Scarcely more than a dozen muscovite mines have ever been operated in Canada, and of these the two largest are located in the eastern portion of the Quebec amber mica area, in the townships of Buckingham and Villeneuve, in Ottawa county. They are now both owned by O'Brien & Fowler, of Ottawa. The general occurrence of muscovite is, in the main, similar in all parts of the world; that is to say, the mineral is always found in pegmatite, or coarse, granitic dykes, the mass of which is composed of feldspar and quartz in varying proportions, and in which the mica crystals occur disseminated. Mining at the above-mentioned localities has been carried on in an intermittent fashion since the early eighties, and considerable quantities of mica, feldspar, and quartz have been shipped.

Pegmatite dykes have almost always well-defined contact with the enclosing country rock, and the mica not infrequently occurs in greatest quantity along or adjacent to such contact, affording a ready indication as to the direction to be followed in mining.

All the muscovite mines in this Province are operated openwork in the readiest and simplest manner. An open cut is driven into the side of the hill traversed by the mica-bearing dyke, and as a rule adjacent to one or other of its contacts with the enclosing gneiss; or, if the deposit is located on the summit of a ridge or hill, the contact is excavated by a series of pits at intervals along it. The mining of such deposits calls for only ordinary methods, such as would be employed in quarrying, the mines being, in effect, open quarries. The following of the mica crystals presents the main difficulty and for this there is no rule, the locating of sufficient mineral to pay expenses being purely a matter of chance. It is almost always necessary, in extracting a relatively small amount of mica, to break a very large quantity of ground, and the removal of this waste constitutes one of the principal drawbacks to mining. Where the feldspar and quartz enclosing the mica crystals occur in a sufficiently pure and non-intergrown state, both these minerals can sometimes be saved as by-products—the feldspar to be used for the manufacture of porcelain and the quartz in electric smelting, the manufacture of ferro-silicon, etc. The feldspar thus saved at the Quebec muscovite mines is shipped to the potteries at Trenton, N. J., and the quartz to Welland, Ont. In addition to the quality of spar sufficient for the porcelain industry, there occurs at the Villeneuve mine a very pure microline feldspar, which is

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Villeneuve Mica Mine

largely used in the manufacture of artificial teeth, and for this purpose brings a high price. There is no machinery used at present at the mines mentioned.

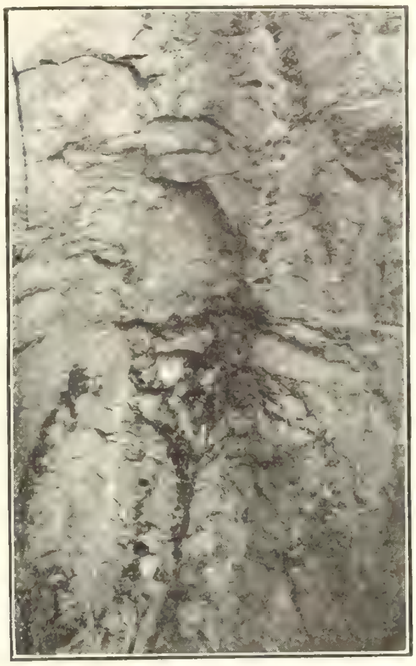
Phlogopite.

Mining (if such a term can be applied to many of the operations carried out in search of this mineral) for amber-mica provides occupation for all and sundry throughout the area traversed by the mica-bearing pyroxenite belts. In the 'between-seasons' farmers frequently forsake their usual employment and blow holes in the rocks at what they consider 'likely' spots—bringing to light smaller or larger quantities of mica as the case may be. The occurrence of amber mica throughout the district lyng between and along the Liivre and Gatineau Rivers, immediately north of Ottawa, is so general that the possibility of its existing in greater or lesser amount on almost any lot cannot be said to be precluded. Mining is carried on principally by small operators, many of whom lease the property they work, and who are seldom possessed of the desire or the means to carry out any active mining.

As a result, the surface of the hills in this region is pitted with small prospect holes, ranging from five to twenty feet in depth, which have been excavated on pockets of mica, and abondoned as soon as the output of mineral became less than the outlay of capital. It must be stated that the occurrence of amber mica is usually totally and entirely against any regular methods of mining and frequently effectually disappoints the most sanguine operator. There are no rules which can be laid down or followed in the search for the mineral, and the forceful factor of chance has to be relied upon in the generality of instances. This accounts, no doubt, for the abundant evidence of unsuccessful expenditure of both energy and money which is to be met with all over the area mentioned. The mineral occurs both in pockets of very irregular shape and extent, an also in more or less well-defined 'leads' which sometimes join up a series of such pockets. These two modes of occurence are the most general. Instances are also found in which the mica crystals are disseminated in a mass of calcite between well-defined walls, the deposit having much of the character and appearance of a true fissure-vein. This class of deposit is easy to follow and to exploit in comparison with the more usual pocketty type, but the amount of mica present in the vein-filling is so variable, and (still more important) the quality of the mineral so subject to deterioration, by reason of crushing and distortion of the crystals, caused by natural pressure in situ, inclusions of foreign mineral substance, a tendency to ribbon-structure (the sheets dividing into narrow strips), brittleness due, often, to the local presence of iron in the deposits, that, in this case also, mining frequently has to be abandoned. A somewhat similar class of deposit is that known as a 'contact', where the mineral occurs in a body of calcite between pyroxene and either crystalline limestone or an acid rock —usually granite gneiss. These two last types are, however, sufficiently alike in their main features to call for a similar method of development, and present few of the difficulties which the pocketty deposits so often place in the way of the operator. Such mica bodies are mined in the manner usually employed in lode-mining, the calcite filling being stoped out in a precisely similar fashion, and the mica crystals collected from the waste rock in the pit as the work proceeds. Some of the deepest mines in the mica district have been opened on either contact or

Mass of Apatite from Blackburn Mica Mine

Muscovite—Mica-bearisg Pegmatite, Cut by Narrow Vein of Trap—Villeneuve Mine

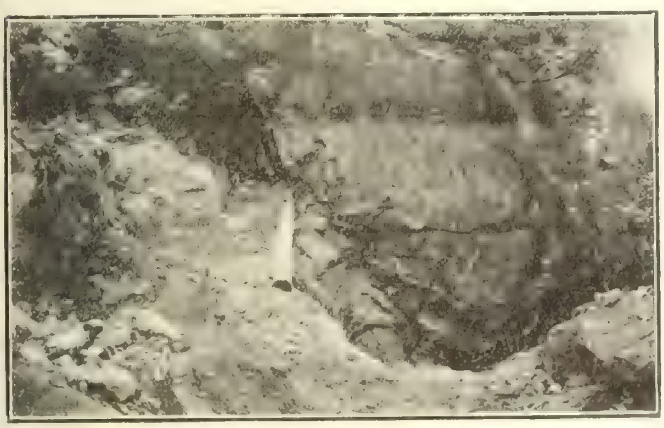


Vein of Amber Mica at Moose Lake Mine

vein deposits. The irregular nature of the pockets and the frequent impersistence of the fissures which sometimes connect them prove serious obstacles in the above-mentioned 'pocket and fissure' class of deposit; and since the majority of deposits are of this type, it is not surprising that so many abandoned pits are to be met with. Many operators have no doubt derived handsome profits from working small surface pockets of mica, for, provided the mineral be of good quality and size, a relatively small pocket will yield a surprising amount of mica, and thousands of dollars worth of marketable sheets are sometimes the result of only a few weeks' work. Such cases are, however, the exception, and the number of small operators who have attempted the exploitation of such deposits and made a success of their venture, is small. Those mica bodies of the vein or contact type, which have been uncovered by small miners, have, as soon as their nature became evident, as a general rule passed into the hands of large syndicates, who continued their development with the aid of machinery and deep shafts—relatively deep shafts, that is, for the deepest excavation in the district, made in following a mica body, probably does not exceed two hundred feet.

Many of the mica mines worked at present, and during the past thirty years or so, have developed from what were originally phosphate pits, and even now, at many points, the two minerals are won simultaneously, though the small price (about $11.00 per ton delivered) offered for the latter mineral, and the limited demand for it, do not encourage operators to pay particular attention to saving it, except where very large bodies are met with. The entire production of phosphate derived from the Quebec mica mines is consumed at Buckingham, Que., where it is utilized in the manufacture of fertilizer and phosphorus. When the writer made an inspection of the mica-mining area in 1911, there were not above five and twenty mica properties in active operation, and few of these employed more than some half a dozen men. Steam is used at the larger mines, both for drilling and hoisting, and also, in some cases, to run a small pump; the last is, however, seldom necessary, the pits being for the most part shallow and often possessing natural drainage.

Derricks are the general means used for hoisting; either open wooden hoist-trays or iron or wooden buckets being employed to contain the rock, etc. The derricks are operated by small steam winches, or, in the case of



Inclined Vein of Amber Mica in O'Brien and Fowler Mine, Range III, Township of East Portland, Que.

Hoist Towers at Blackburn Mine, Templeton, P.Q.

the smaller mines, by horse power—either direct traction or with the help of a large wooden drum or whim. Drilling is usually done by steam in the case of a mine whose value has been demonstrated, (in so far as this can be said to be possible in the case of a mica mine), Rand drills being the most commonly used. At many of the smaller mines, however, double-handed hand-drilling is practised. The holes are, as a rule, shallow, and are only lightly loaded, (except where the object is to remove dead rock) being so placed as to loosen the rock rather than to shatter it. These methods are essential in order to preserve the mica crystals as far as possible from injury. Dynamite is the explosive generally used, and both fuse and battery firing are employed.

The mica crystals are collected as soon as ground has been broken and are transferred to the cobbing-shed, where they are roughly sorted and freed from adhering rock, phosphate, etc. From here they proceed to the culling-shed (commonly called "mica-shop"), and here the crystals are split into sheets of some one-sixteenth of an inch thickness. The rough edges are trimmed off, and the clean plates are then packed into barrels and shipped to the factories, where they are thin-split into flakes of one to two one-thousandths of an inch (one to two mile,) and manufactured, with the aid of shellac or some similar preparation, into mica-board or micanite. The more solid and perfect sheets, which are free from creases, inclusions, and other imperfections, and exceed 2x3 inches across, are cut into rectangular pieces of the dimensions required by the consumers and are employed without any further treatment in dynamos and other electrical machinery. Girls are usually employed in the culling-shops, and also in the thin-splitting department of the factories, and are generally paid by the weight of the splittings they produce. Scrap mica, composed chiefly of the refuse from the culling-sheds and splitting-shop, is utilized for the manufacture of ground or pulverized mica, which is used for giving a finish to wall-paper, in refractory paints, in rubberoid roofing material, and even as an absorbent for nitro-glycerine in the manufacture of dynamite. There are three grinding plants in Canada at present engaged in the preparation of mica powder—all three being operated in conjunction with factories concerned in the manufacture of mica-plate. The refuse mica from the mines is not so fitted for this process owing to the amount of foreign matter often present in it, but with careful screening or cobbing could be similarly utilized. Large quantities of such mine refuse exist at the various mines and would be available should a demand spring up. The price of scrap mica for grinding varies very much according to qualty, as does that of the powder produced; the price of the latter depends also largely on its finess, the various grades ranging from 60-mesh to 200-mesh. Many operators have, during the last few years made a practice of accumulating large stocks of mica, (as a rule prepared ready for market), and there is not likely, in the near future, to be a sufficient shortage of supplies to materially enhance present prices. The largest consumers of the mineral operate their own mines, in addition to which the buy up parcels of mica from the small mines; but as the former appear to possess, in most cases, sufficient reserves of the mineral upon their own properties, they can usually buy at their own prices. The chief effect of this policy of hording mica is to increase the demand for foreign (either American or Indian) mineral, and this is now largely used in place of the amber variety, despite the fact that it is slightly harder and not or such high quality as the latter.

The amount of sheet mica employed in the stove industry would appear to be steadily decreasing, though lamp chimneys and shields still consume a quantity. Only the clearest sheets of muscovite or white-mica are suitable for these purposes, and the supply is derived entirely from foreign countries.

The grading of the mica intended for foreign shipment would appear (from advice received from one of the largest English consumers), to leave much to be desired, and is largely responsible for the poor reputation consignments of Canadian mica possess in foreign markets. There is no question of the superior quality of Canadian phlogopite for the purpose (electrical) for which it is required; but would-be buyers claim that shipments are not uniform, and are, above all, seldom up to sample standard, large quantities of absolutely useless, crumpled and ragged, mica being often included to make up weight.

These tactics can only serve to injure the Canadian mica industry, (and have, in fact, already done it much harm), while improving that of other mica-producing countries. The total value of the mica produced in Quebec in 1911 was $76.433, while the total value of production for the whole of Canada during the same year amounted to $119,863, a decrease of $70.522 over the previous year's output. The figures of production are compiled from returns furnished by producers, and are often misleading, owing to the practice pursued by operators of accumulating stocks of mica—the returns of production usually referring to the quantity actually sold in the year in question, irrespective of when it was mined. Thus, a quantity of mineral may sometimes figure in the production returns of a year long subsequent to the closing down of the mine from which it was obtained. In another case, record of a production so sold may be entirely overlooked, the amount not figuring in the returns of any year. The current prices of amber-mica are approximately as follows, the figures being furnished by a large Ottawa firm:

1 in. x 1 in.	4 cents.	2 in. x 4 in.	60 cents
1 in. x 2 in.	10 cents.	3 in. x 5 in.	75 cents
1 in. x 3 in.	18 cents.	4 in x 6 in.	90 cents
2 in. x 3 in.	40 cents.	5 in. x 8 in.	over $1.25

ZINC AND LEAD IN QUEBEC.

The only lead-zinc deposits mined in the Province are those of Calumet Island. These have been worked intermittently since the early "nineties," but in the last two years operations appear to have been more systematically conducted, and in 1911 development work on a relatively large scale was undertaken. Calumet Island is situated about fifty miles up stream from Ottawa, and is formed by two channels of the Ottawa River. The rocks here are the typical Laurentian gneisses and crystalline limestone, with basic intrusions. The ore deposit may perhaps be best described as Fahlbands. They doubtless can be profitably mined under skilled direction.

Another galena occurrence—a prospect only—near Notre Dame des Anges, Portneuf County, is now being developed.

PHOSPHATE IN QUEBEC.

The production of phosphate was at one period the principal mining industry of the province. The industry dates from 1871, when a few tons were mined near the Little Rapids, on the Lièvre River. Thenceforward production increased rapidly, reaching the maximum in 1885, represented by an output of 28.535 tons

valued at $490,331. For a time thereafter the industry held its own, but gradually declining, was practically non-existent in 1895. Meanwhile there appears a likelihood of a revival of interest; indeed, of late negotiations have been in progress for the acquisition of properties near Buckingham. The time is not far distant when there will be a large home demand for artificial fertilizers. This demand will increase steadily. With a home market for the product the phosphate industry would again be an important one. As is well known, the decline of the Quebec industry was directly due to the discovery of extensive phosphate deposits in Florida and Tennessee, and the conditions were such to enable these deposits to be worked and the product marketed abroad more economically than was possible in our own industry. The Quebec phosphates occur as apatite in masses and dykes of pyroxenites, cutting the Laurentian gneisses of the region to the north of the Ottawa River.

The production in 1911, by the way, was 595 tons, valued at $5,832.

PERSONAL AND GENERAL

Mr. John L. Retallack, of Kaslo, British Columbia, has returned to that province from a visit to England.

Mr. A. W. Davis, one of the mining engineers on the staff of the Consolidated Mining and Smelting Company of Canada, Ltd., has been examining mineral claims near Hazelton, Skeena district, B.C.

Mr. S. S. Fowler, general manager of the New Canadian Metal Company, operating the Blue Bell lead-silver mine on Kootenay Lake, B.C., was in Victoria lately.

Mr. C. H. Clapp, of the Geological Survey, has resumed his geological work on Vancouver Island, in which part of British Columbia he has been engaged each field season from 1908, inclusive.

Mr. Colin Timmons, mining engineer, until recently of Taxco, Guerrero, Mexico, arrived at Hedley, Similkameen, B.C., from Los Angeles, California, on June 4, to examine the Kingston mining property for San Francisco clients.

Mr. J. M. Gordon has been examining mineral claims near Rossland, and others in Ymir district, B.C., for a Montreal company, stated to also own coal lands in southwestern Alberta.

Mr. W. Hutchison, for some time at the Hillcrest Coal and Coke Company's colliery, near Frank, Alba., lately removed from that part of the province to a coal mine farther north.

The Hon. Richard McBride, Premier and Minister of Mines for British Columbia, has been knighted. He is now Sir Richard McBride, K.C.M.G.

Mr. A. B. Ritchie, a McGill 1906 graduate in mining engineering, lately left New Denver, British Columbia, for Montreal, after having spent several years out West.

Mr. A. J. McMillan, liquidator of the Le Roi Mining Company, Ltd., will shortly return to British Columbia from England. A short time ago he made a further distribution of one shilling a share among Le Roi shareholders.

Mr. H. A. Brandt has been appointed superintendent of the British Columbia Copper Company's Lone Star and Washington mine, which is situated immediately south of the International Boundary and within ten miles of the company's smeltery at Greenwood, B.C.

Mr. John Gibson, Jun., has retired from the position of superintendent of the Union colliery of the Canadian Collieries (Dunsmuir), Limited, in Comox district, Vancouver Island. Mr. Gibson was from Pittsburg, Pa.; he had also been two years in Spitzbergen.

Mr. J. Edgar McAllister, of New York, consulting engineer to the British Columbia Copper Company, has recently been on one of his periodical visits to that company's properties in British Columbia.

There have been some changes made at the Union colliery of the Canadian Collieries (Dunsmuir), Ltd., Vancouver Island, B.C. The several mine managers there now are: Mr. Robert Henderson, in charge of No. 4 mine; Mr. J. H. McMillan, of Nos. 5 and 6, and Mr. Thomas A. Spruston, of No. 7.

Mr. John Hopp, well-known in connection with his extensive placer gold mining operations near Barkersville, Cariboo district, B.C., was ill at his home in Seattle, Washington last month. About two years ago he suffered during several months from ptomaine poisoning, and it is thought likely his late sickness was a return of the old trouble, the effects of which he had occasionally felt since convalescence after his earlier serious illness.

Mr. Geo. Watkin Evans, of Seattle, Washington, who recently resigned as Chief of Coal Surveys for the Washington State Geological Survey, has gone to the anthracite field at the headwaters of Skeena River, British Columbia, to examine and report on coal lands in that district held by the National Finance Company, of Vancouver, B.C.

Mr. Thomas Graham, chief inspector of mines for British Columbia, left Victoria on June 12 for Columbus, Ohio, to attend the fourth annual convention of the Institute of Mine Inspectors. Before returning to British Columbia, Mr. Graham will visit the United States Bureau of Mines' testing station at Pittsburg, Pennsylvania, and afterward endeavour to see some representative coal mines in the State of Illinois.

Mr. James McEvoy, of Toronto, was in Vancouver, B.C. early in June, outfitting a party to do further development work on the coal property of the Western Development Company, situated in the Groundhog basin coalfield, upper Skeena district of British Columbia, which district Mr. G. S. Malloch, of the Geological Survey examined in a preliminary way last autumn, and will investigate to a larger extent this year.

GOLD AND SILVER IN QUEBEC.

Mining for gold in the Province is at present confined to the hydraulic operations of the Champs d'Or de Rigand-Vaudreuil (formerly the Dominion Gold Fields, Ltd.), in Beauce County, and to development working by the Union-Abitibi Company, on a quartz claim north of Lake Opazatica. Here a shaft has been sunk to a depth of rather over 150 feet, and drifts carried therefrom at intervals. From the amount of work done the claim has clearly not yet passed the prospect stage. Yet a power plant and stamp mill has been provided in readiness for the treatment of the ore—when it materializes.

Beauce Hydraulic Co.

Late last autumn some excitement was occasioned by reported gold finds in Risborough Township. The discoveries in two localities were investigated by Mr. T. C. Denis, the Superintendent of Mines, who reports that the quartz deposits occur in the slates, which constitute the country rock, near the contact with diabasic intrusions in one case and apparently porphyrites in the other. Some of the quartz veins are from 10 to 20 inches wide, and in the immediate vicinity of the larger veins the rock shows a network of smaller quartz veins. Values, however, were practically negligible. The silver now produced in Quebec is recovered from the cupriferous pyrite ores of the Eastern Townships. There is also a small yield of gold from this source.

ONTARIO MINES—FIRST QUARTER OF 1912.

Returns to the Bureau of Mines for the first three months of 1912 show the output of the metalliferous mines and works of Ontario to have been as follows:—

Product.	Quantity.	Value.
Gold, ounces	573	10.266
Silver, ounces	7,439,044	4,092,405
Copper, tons	2.537	360.799
Nickel, tons	4.722	1,009.702
Pig Iron, tons	116,824	1.858,274
Cobalt and Nickel Oxides, Crude Cobalt material, etc., lbs.	538,170	100.365

Silver—Compared with the first three months of 1911, silver production showed an increase in value of $383,861, though the quantity was less by 91,443 ounces. Cobalt proper produced 7,006.842 ounces, South Lorrain 285,042 ounces and Gowganda 147.103 ounces. Shipments were:—Ore 4,346 tons, concentrates 2.528 tons, bullion 1,445,834 ounces. Of the total quantity of silver 4.197,161 ounces were obtained from ore and concentrates treated in Ontario plants. Adding bullion shipped by the mines themselves, over 75 per cent. of the total yield of silver was recovered in Ontario.

Gold—A decrease of $13,274. In the early part of 1911 the experimental stamp mills at Porcupine were at work. Later in the year they were destroyed by fire, and at neither the Dome nor the Hollinger had the new plants begun to produce during the first quarter of 1912. As a consequence, Porcupine's contribution to the gold output was small.

Nickel—An increase in quantity of 518 tons and in value of $124.710.

Copper—The output is greater by 416 tons in quantity and $57.559 in value.

..Pig Iron—An increase of 1,579 tons in quantity and $34.557 in value.

Iron Ore—In the first quarter of 1911 shipments amounted to 11.621 tons, no shipments were reported during the corresponding period in 1912

..Cobalt Material—Practically all the Cobalt oxide now used comes from the mines of Cobalt district. Production has for the time being ceased in New Caledonia, whence large quantities of Cobalt ore were formerly exported to Europe.

THE PROVINCIAL MINES BRANCH AND THE MINERAL RESOURCES OF QUEBEC

By the Hon. C. R. Devlin, Minister of Mines.

The mineral resources of a country should be regarded as a source of national wealth, and, as such, it is a Government's duty to do all in its power to encourage and foster their rational development and exploitation.

The Government can be a factor in several ways in the achievement of this object: 1st, by its mining laws; 2nd, by diffusing knowledge concerning possibilities of our mineral resources; 3rd, by explorations in the field in charge of unbiassed and able investigators; 4th, by the publication of reliable statistics and information for the guidance of investors.

The Quebec Government wishes primordially to encourage and protect the bona-fide prospector, for it is on his arduous pioneering work that depends the discovery of mining regions now unknown. The Quebec mining law is liberal toward him, and the conditions which he has to fulfill to hold mineral claims are not at all onerous, while the compulsory assessment work required is a guarantee against "blanketting."

In respect to mining laws, those best fitted to judge of their efficiency must necessarily be the men who are directly interested in mining. It may be pointed out that the mining community has been consulted, through the Canadian Mining Institute, through enquiries from prospectors, through operators of mines, in the framing of our present Quebec laws, and the Government intends to freely avail itself of these means to change or further improve our mining regulations as needs arise.

It is interesting to note that the United States Government is at present considering the revision of their mining law, and, in this connection, Dr. George Otis Smith, Director of the Geological Survey, after a careful study of the matter, advises the following principles as being fundamentally essential to efficient mining laws: 1st, separation of the mining rights from the surface rights; 2nd, a leasehold system in preference to a fee simple tenure; 3rd, rigid enforcement of annual assessment work.

The Quebec mining laws are practically based on these three principles.

Field investigations in mining districts are regularly carried out by the Quebec Mines Branch. This does not imply that the Government should carry on prospecting with the view of discovering metalliferous veins or other mineral deposits, but it is one of the important duties of a Department of Mines to obtain accurate and unbiased information on the mineral resources of certain regions and to work out the geology, as a guide to the prospector, the miner and the investor. Following this principle, the Quebec Mines Branch has, in the course of the last two years, organized and sent out geological parties to the Chibougamau region; in the Temiskaming district; in Abitibi; on the north shore of the lower St. Lawrence. Reports have been published or are at present in press. This work will be actively pushed in the future.

Our mining laws provide for the imposition of a royalty on minerals extracted. These regulations have not yet been enforced, but it is only fair that the Government should derive some slight revenue from well-established and remunerative industries which are based on mining concessions and mining rights obtained from the Crown at practically nominal figures, as compared with the value of mining properties under exploitation, and the collection of such a tax would in no way militate against the welfare of the mining industry.

The Quebec mining industry is comparatively young, but our Province is rich in mineral possibilities. The railways under construction and those which are projected will open up immense territories fraught with mining possibilities, which will be heard from as soon as means of access are accomplished facts, and the development of our mineral resources has a bright future before it.

RAILWAYS AND THE MINERAL INDUSTRY.

In the near future railway communication will be established between Quebec City and Lake Abitibi, by the completion of this section of the National Transcontinental. Again, the construction of a line bordering the Quebec side of Lake Temiskaming, to afford communication between the settlements of Northern Temiskaming and the main line of the Canadian Pacific Railway, is practically assured. The extension of this line northward to connect with the Transcontinental is also probable. Still another railway is projected from the Nottaway, or James Bay, to provide communication with Montreal. From the main lines numerous branch lines or feeders will be established in due course. This programme of railway building is based on the expectation of returns from the development of the agricultural and forest resources of the regions to be traversed; but doubtless a very considerable revenue will also be derived from new mining industries. This, at least, has been the experience in this country in the past. Thus the Quebec Central, between Sherbrooke and Quebec, was built to advantage along the rich agricultural valleys of the Chaudière and St. Francis Rivers; but at present the asbestos mines of Thetford and Black Lake, which were discovered as a consequence of railway construction, are the main freight contributors to the railway. In Ontario, the Timiskamingue and Northern Ontario Railway was built to colonize that part of the Province to the north of the Canadian Pacific Railway. The mines of Cobalt, which were discovered during construction, and the mining district of Porcupine, are now by far the main sources of revenue of this railway. While, as is well known, the nickel-copper mines of Sudbury were discovered during the construction of the main line of the Canadian Pacific Railway. Consequently, although it would be unwise to build railways on the revenue possibilities of the undeveloped mineral resources of a region alone, yet in Ontario and Quebec the conditions are such that important mining development may usually be expected to follow the opening of new territory by railway construction; and the industry thus established invariably contributes in a large measure to the railway traffic receipts.

PROGRESS OF THE MINING INDUSTRY IN QUEBEC

Although no very notable new mineral discoveries have been made in the Province of Quebec in recent years, the industry has made continuous and steady progress from year to year since 1903, as evidenced in the following table:

Year.	Value.
1903	$2,772,762
1904	3,023,568
1905	3,750,300
1906	5,019,932
1907	5,391,368
1908	5,458,998
1909	5,552,062
1910	7,323,281
1911	8,677,986

In 1899 the value of the mineral production was $2,083,272. The returns for 1911 represent, therefore, an increase in twelve years of 316 per cent. This showing, it is interesting to note, compares most favourably with that of the other Provinces of the Dominion in respect of mining development, as will be observed from the figures appearing in the following table, compiled from statistics published by the Federal Department of Mines:

Mineral Production of Canada, by Provinces, 1899 and 1911.

	1899.	1911.	Increase in 12 years.
Canada	$49,234,005	$102.291.696	107.7%
Ontario	9.819.557	42.672.904	334.5%
British Columbia	12.653.860	21.237.801	67.9%
Nova Scotia	6.996.041	15.354.928	119.5%
Quebec	2.585.635	9,087.698	251.5%

Thus the only Provinces whose mineral industry has made greater progress than that of Quebec during the period here considered is Ontario, whose advantage in this respect is, directly, attributable to the discovery and development of the Cobalt silver mines. In northern, and more particularly in northwestern Quebec, are large areas, the geological conditions of which are apparently very similar to those obtaining at Cobalt. Porcupine and Sudbury; and there is every reason to hope, therefore, that important new discoveries of mineral will be made in these practically unexplored areas.

The following table includes a statement of the mineral production of the Province in 1911, as finally revised; while also showing the number of men employed in the industry and their earnings during the twelve months:

	Number of Workmen.	Wages.	Quantities.	Value.	Value in 1910.
Asbestos, tons	2,911	$1,228.971	102.224	$3,026.306	$2.667.829
Asbestic, tons	...	......	25.733	19.802	17.612
Copper and sulphur ore, tons	178	100,130	38,554	240,097	145.165
Gold, oz.	...	......	590	11.800	.....
Silver, oz.	...	......	23.000	11.500	.....
Bog iron ore, tons	48	6.400	931	4.041	4.406
Ochres, tons	50	15.518	3.612	28.174	33.185
Chromite, tons	13	3.085	197	2.469	3.734
Mica, lbs.	186	48.101	......	76.428	51.901
Phosphate, tons	5	......	595	5.832	3.182
Graphite, lbs.	274	64.535	753.405	33.613	15.896
Mineral waters, gals.	36	5.645	168.489	65.648	68.155
Titaniferous ores, tons	26	724	3.789	5.684	5.292
Slate	25	7.522	......	8.248	18.492
Cement, bbls.	627	443.842	1.588.283	1.931.183	1.954.646
Magnesite, tons	8	3.194	885	6.416	2.160
Marble	170	105.739	......	143.457	151.103
Flagstone, squares	2	500	6	500	890
Granite	423	239.704	......	308.545	291.240
Lime, bushels	226	118.171	1.284.914	284.334	279.306
Limestone	1.255	569.818	......	1.128.402	503.173
Bricks, M.	1,280	362.663	176.532	1.129.480	906.375
Tiles, drain and sewer pipe, pottery, etc.	21	3.922	......	142.223	197.526
Quartz, tons	...	......	500	1.125	2.013
Feldspar, tons	...	......	30	600	
Peat, tons	12	3.000	175	700	
Glass sand	2	413	440	1.179	
Sand	68	34.206	......	62.000	
Totals	7,846	$3.365.803	4.172.884	$8.679.786	$7.323.281

MINING LAWS IN THE PROVINCE OF QUEBEC

No change or amendments were introduced in the Quebec Mining Law during the last session of the Provincial Legislature; but in the last three years, the mining laws have undergone such radical alterations, that it is permissible to give a short résumé of the principles now in force.

The amendments assented to by the Quebec Legislature in May, 1909, replaced the prospecting permit, which were previously in force, by the Miner's Certificate; this is the equivalent of the Free Miner's Certificate of British Columbia, and to the Miner's License of Ontario. This certificate, issued on payment of $10.00, gives the right to prospect for minerals on all lands, of which the mining rights belong to the Crown, without giving exclusive rights over a large territory, as did the exploration permit. The bearer of a Miner's Certificate is allowed to stake five claims of forty acres each, or a total maximum area of 200 acres. This may be held for six months without having any payment to make. At the end of the six months, the holder has to take out a mining license, which is practically a leasehold, for which he has to pay a yearly rental of 50 cents an acre. Assessment work on the claims staked has to be performed to the amount of 25 days' labour during the first six months following the staking, and 25 days a year afterwards on each forty acres.

Mining lands can also be acquired by purchase, at the rate of $10.00 an acre for lands situated 20 miles or more from a railway, and $20.00 for lands nearer than 20 miles. Moreover, in case of purchase, all money paid as yearly rental on the mining license goes towards the purchase price of mining lands.

In this connection it is interesting to note that the United States Government has lately thoroughly studied the question of amending its "public land laws" with the object of encouraging the systematic and rational development of the mineral resources, with due respect to the principles of sound conservation of these resources. Commissions have been appointed to study the mining laws of various countries, and in this connection it is most interesting to quote from the report of Dr. George Otis Smith, the distinguished director of the United States Geological Survey.

In his last annual report, Dr. Smith very ably discusses the question of amendments to the United States mining laws, and the principles which he advocates as being the soundest for promoting the development of the mineral resources are as follows:

Separation of Surface and Mineral Rights.—"The first step, both in principle and practice, in an amendment of the land laws, appears that of making possible by legislation, the separation of surface and mineral rights whenever the two estates have values which can be separately utilized."

Compulsory Assessment Work.—"Most important, perhaps, in any amended mining law, would be provision for enforced development work, a principle expressed, it is true, in the present United States law, but not made effective in its workings. A requirement of actual use as a condition of occupancy of mineral land cannot be regarded as either novel or radical. As regards the large acreage of undeveloped land in many mining camps (in the United States) to which patent has already been issued, it is, perhaps, true that the situation is without relief, unless the Western Australia plan is adopted, whereby the Government steps in and permits mining under a lease, the proceeds of which are assessed, collected and paid over to the owner. The principle invoked seems to be that no property owner can rightfully oppose the development of the resources of the State.

"In the case of unpatented claims, a remedy should be sought, for what has been termed "the paralysis of mining districts," and the rigid requirement of annual assessment work should be made active and effective by inspection and supervision, in order to put an end to the present procedure of allowing a claim to be idle for practically two years after its location, not to mention the many localities where claims are held year after year with only perfunctory compliance or even without any performance of assessment work.

Leasehold System.—"The remedy, then for the existing evil of idle mining property must be sought in the adoption of leasehold, under which the Government can enforce operation, a system which fully attains the desired end of promoting mining development in Australia and New Zealand, or in the thorough revision of the present system. . . .

"The greatest advantage of the lease system to the operator directly, and the public indirectly, is relief from the large capital outlay now required in the acquisition of the large acreage absolutely necessary for a medium mine (this applies more particularly to coal). This argument advanced against the present policy of valuing the public coal lands at even conservative prices, thus becomes an argument for a leasehold law."

Oil and Gas Lands.—"The most urgent need of legislation (in the United States) for the disposition of mineral deposits, is in the case of oil and gas. First, the new law should authorize the issue of exploratory permits, granting to individuals or associations the exclusive privilege of occupation, the sole condition of such a grant being diligent and adequate prosecution of development, measured by the expenditure of fixed sums within certain periods, with possibly the payment of a small fee to the Government in lieu of expenditure during the first six months. In the second place, the law should provide that upon discovery, the holder of the permit be given a leasehold title with a royalty varied to meet the local needs and actual conditions."

The present mining law of the Province of Quebec practically embodies the above principles. By the mining law, sanctioned on July 24th, 1880, a separation of the mining rights from the surface rights was definitely effected. In all grants and patents issued since that date, they constitute two separate and independent properties, each subject to distinct separate regulations. In all patents issued before that date, the gold and silver mines were always reserved and still belong to the Crown, except in cases where these minerals have been specifically alienated.

A definite amount of assessment work is specially exacted, to be performed on all unpatented mining claims, and the yearly renewal of the mining license is made subject to the performance of that work.

Patents of claims are issued subject to a yearly performance of work to the amount of $200, or to an annual acreage tax of 10 cents an acre in the case of non-performance of the work.

The Quebec Mining License is practically a leasehold system at a fixed yearly rental per acre. If, after hav-

ing worked and developed a claim, the mining licenseholder wishes to, obtain a patent, he can do so by paying $10 or $20 an acre, according to distance from a railway. It has been objected that these purchase rates are high, but it must be remembered that the patent need not be applied for until the licenseholder has ascertained beyond all doubt the value of the mining claim, and in the case of a developed and proved mineral claim, these prices are insignificant relatively to the value of a mining property. Moreover, it is to be remembered that all money paid in as yearly rentals go towards the purchase price when the patent is granted.

The remarks of Dr. Smith regarding the oil and gas lands apply to the Province of Quebec, whose mining laws do not well apply to these substances, and they should be amended accordingly. There is at present a case in point, of a possibly valuable gas field which would benefit by more rational regulations.

The mining license as issued by the Department of Colonization, Mines and Fisheries, constitutes an absolutely secure title when the conditions, as set forth in the mining law, are fulfilled. These conditions are not at all onerous, and are very easy to comply with, and when this has been done, the Department is bound to renew the license; practically no discretionary power is left the authorities in this case. A certain amount of uneasiness seems to exist, due to the fact that the license expires yearly and is renewed for one year only, but such a feeling is quite unjustified. However, to allay it, it might, perhaps, be advisable to amend the law, permitting the issuance of longer leases, say 20 years, subject to the performance of the yearly conditions.

EARLY MINING LEGISLATION IN QUEBEC AND OTHER NOTES

By J. Obalski.

Under the French regimé little attempt was made to discover or develop the mineral wealth of the Province; and operations in these early days was practically confined to iron mining and smelting in the vicinity of Three Rivers, where in the "Forges du St. Maurice" charcoal iron was made from the bog ores. These ores, by the way, are still being utilized at Radnor and Drummondville.

In the issue of title of seigniories, the mineral rights were reserved to the Crown, under the old French law. The observance of this principle was maintained under English rule and is still recognized.

Copper was discovered in the Eastern Townships in 1860. The law as applying to these townships was not specific, and in consequence it was conceded that the owners of surface rights should also be entitled to the mineral rights. Notwithstanding this decision, patents have since been issued in which specified minerals have been reserved by the Crown.

Upon the confederation of the Canadian Provinces in 1867, Quebec, by the British North America Act, was conceded jurisdiction and control of its natural resources, including minerals. The old law respecting the reservation of mineral rights in seigniories, and of the Crown's prerogatives as regards the precious metals was not repealed. No legislation affecting the mining industry was introduced until 1874, when regulations were adopted governing the acquisition of mining laws, embodying the pinciples of license and purchase. A distinction was also made between the "superior" and "inferior" metals.

The apatite deposits in Ottawa County were discovered in 1878, and special regulations were made more especially for the protection of the farmers (the owners of the surface rights.)

The Quebec General Mining Act, sanctioned on July 24th, 1880, was, however, the first real attempt at constructive legislation applicable to the needs of the mining industry. It was framed by lawyers. Consequently, in some matters of practical importance it was deficient.

Shortly thereafter, the Quebec Bureau of Mines was established, but with very inadequate financial provision. The mineral industry was meanwhile beginning to assume importance. The phosphate industry flourished; development of the asbestos mines had commenced; while copper mining near Sherbrooke was being successfully conducted. In view of these conditions the Government of the time decided that the industry should contribute to the revenues of the Province, and legislation of a radical character was enacted in 1887, based on principles widely differing from those previously recognized. This legislation, though in many respects well-considered, was, nevertheless, premature, and was repealed in 1890. A new Act was adopted providing for a return, practically, to the original system. This Act was in force until 1908.

It is unnecessary to refer to more recent developments. The fact, however, that the Quebec Government has of late displayed an earnest disposition to promote the development of the industry in the Province, is a matter for sincere congratulation. The support now accorded the Bureau of Mines is encouraging. Its scope of usefulness has been greatly extended. Exploration and geological parties are now despatched every summer to investigate and report on the outlying areas and other means are taken to direct attention to our actual and potential mineral resources

UNPROSPECTED AREAS IN QUEBEC.

The area of the Province, prior to the addition of Ungava in March of this year, comprised approximately 352,000 square miles. With the inclusion of Ungava the area has been increased to over 700,000 square miles. Of this, 50,000 square miles is settled. In the settled districts mineral industries have been established and the resources are, in a relative measure, known. There thus remains 650,000 square miles of practically unexplored and unprospected territory, the greater part of which is underlain by rocks of pre-Cambrian age. There is, therefore, no Province in the Dominion in which the potentialities of mineral discovery and development are greater, and ere long this will be more generally recognized.

GRAPHITE IN QUEBEC

By H. P. H. Brumell, Buckingham, Que.

Notwithstanding the fact that graphite mining and refining have been carried on for a great number of years in the Province of Quebec, it is only recently that any importance has been attached to the industry. The present interest is occasioned not by new discoveries, but rather by the solution of the problems of concentrating and perparing the product for the market.

The workable ore deposits are in general of the disseminated type and the graphite contained is usually of such percentage as to necessitate the local treatment of the ore, the values rarely being sufficiently high to warrant shipment in the crude form.

While the mineral is largely distributed throughout the crystalline rocks of the Province, it has only been found in commercial quantity in the counties of Labelle and Argenteuil, both lying to the north of the Ottawa River. In these two counties, in the so-called Grenville or Hastings series of Laurentian rocks, it occurs both in disseminated and vein form, though, as previously stated, the former variety has alone proved valuable. In Labelle County, in the townships of Buckingham and Lochaber, are large areas of graphitic gneisses carrying from a trace to as high as 40% of graphite. The gneiss, where graphitic, is composed principally of quartz, orthoclase, sillimanite and hornblende, and, in places, mica; although when the latter mineral is present the ore is not considered workable. In Argenteuil County the usual gangue is limestone wherein the graphite is found in segregated masses and disseminated, the occurrence invariably being in the vicinity of intrusive rocks and it is at, or near, the point of contact that the greatest quantity of graphite is found. When occurring in limestone the usual accompanying minerals are wolaztonite, pyroxene, hornblende, quartz, and titanite with, occasionally, mica.

Buckingham Graphite Mill

Space does not permit of more than a passing mention of the various efforts to produce merchantable graphite during early years. One of the first attempts was in the township of Buckingham, where, near Donaldson's Lake, a mill was erected shortly after 1867 and was operated, to produce stove polish stock, until about 1872. The following year the mill was burned and not rebuilt. Shortly after this a second mill was erected on the Blanche River in Lochaber township, and after unsuccessfully treating 600 or 700 tons of ore, was abandoned. This, in turn, was followed by the mill erected by the Dominion of Canada Plumbage Mining Company near Devine Lake, in Buckingham Township, in 1876, and shortly afterwards by the Pew & Weart mill, north of Donaldson's Lake, in the same township. Neither of these mills was successful. Coming down to more recent years, the North American Graphite Company erected a mill near Plumbago Lake, in Buckingham, in 1895 which after a checkered career and after having passed through several hands was remodelled by the Buckingham Graphite Company and became a large producer. This mill was followed, in Buckingham Township, by that of the Diamond Graphite Company and, later, the Bell Graphite Company, neither of which plants proved successful. The Dia-

mond Graphite Company mill was later purchased by the Peerless Graphite Company, who produced some high grade stock. The Bell Graphite Company mill was erected with the intention of utilizing an oil process which however, proved unsuccessful and efforts are now being made to make it pofitable by using an entirely dry process. During 1911 The Dominion Graphite Company erected a large mill, also in Buckingham Township, which is operating successfully at the present time. In Argenteuil County, the only mill erected was that of the Calumet Mining and Milling Company at Calumet. This mill had but a very short career partly on account of lack of ore but principally by reason of the method of refining. At the present time a mill is in course of erection at St Remi d'Amherst on property owned by Graphite, Limited, Montreal, who have opened up and developed to a depth of, it is said, 100 feet, a deposit of considerable extent.

mation available, the various operators are very secretive as to their methods and operations, and it is therefore impossible to write authoritatively regarding them. The companies that were active during the past year were:

The Buckingham Graphite Company, lot 28, range vi, Township of Buckingham. Capacity of mill, 100 tons of ore per day.

The Bell Graphite Company, lot 2, range v, Township of Buckingham. Capacity of mill about 50 tons of ore per day.

The Peerless Graphite Company, successors to the Diamond Graphite Company, lot 14, range x, Township of Buckingham. Capacity of mill about 40 tons per day.

The Dominion Graphite Company, lot 20, range v, Township of Buckingham. Capacity of mill 250 tons of ore per day.

Dominion Graphite Co. Mill

It has not been thought necessary to make more than the foregoing brief mention of the various mills of the Province to the ill-success of most of which is attributable the long delayed success of the industry. That the Province is capable of producing and supplying, in large quantities, a very high grade graphite is evidenced by the operations during the past year of the Dominion Graphite Company, which company is now producing considerable quantities of a high percentage crucible stock of high refractory power which finds a ready market with the crucible makers of the United States and Great Britain. The crucible maker demands for his purpose a crystalline graphite high in carbon and low in iron and lime with absolute freedom from mica, all of which conditions are now obtainable from a properly sorted ore when treated according to modern methods.

As is usual in the inception of any business or industry regarding which there is but little definite infor-

During the past five years there has been a steady growth in the production of graphite in the Province of Quebec and it should be borne in mind that this entire output is of finished material as no crude ore was shipped.

Annual production of graphite:

Year.	Tons.	Value.
1907	....	$ 5,000
1908	....	165
1909	134	10,176
1910	155	15,896
1911	377	33,588

As illustrative of the possibilities for the graphite industry in this province the following tables may prove of interest.

World's production of graphite.

Year.	Short tons.	Value.
1904	100,922	$3,063,386
1905	118,938	3,165,439
1906	128,793	4,315,965
1907	143,930	3,818,842
1908	106,741	3,410,130
1909	115,823	4,177,762

The distribution of the world's production during the last two years available was, as follows:

Country.	Quality. 1908. Tons.	Value. 1908.	Quantity. 1909. Tons.	Value. 1909.
Austria	48,970	$ 349,118	44,875	$ 320,289
Canada	251	5,565	863	45,999
Ceylon	28,916	2,593,160	36,056	3,237,751
Germany	5,340	60,264	7,467	64,724
India	3,218	69,814	3,508	60,972
Italy	14,235	71,758	12.768	71,148
Japan	195	8,592	136	5,290
Mexico	1.742	28.426	1.878	25,301
Norway	1,192	13.005	......	....
Sweden	73	2.046	29	779
Queensland	22	292	......	....
United States	2.587	208,090	8,243	345,509
	106,741	3,410.130	115,823	4,177,762

As all the graphite produced in the Province of Quebec is of the so called crystalline quality, the material from Ceylon and part of that from the United States constitutes, at present, the only competitive product, as, with the exception of a small quantity of a very small flake produced in Bavaria, the production of the other countries is of amorphous material.

Assuming the foregoing statement to be correct there is an annual production of crystalline graphite as follows:

Year	Ceylon Tons	Ceylon Value	United States Tons	United States Value	Total Tons	Total Value	Value per ton
1904	28,909	$2,090,747	2,840	$238,447	31,749	$2,329,194	$73.00
1905	34,319	2,323,184	3,018	237,572	37,337	2,560,756	69.00
1906	39,303	3,388,227	2,944	238,064	42,247	3,626,291	86.00
1907	36,406	2,889,596	2,474	171,149	38,880	3.060,745	79.00
1908	28,916	2,593,160	1,140	132,840	30,056	2,726,000	90.00
1909	36.056	3,237,751	3,147	313.271	39,203	3,551,022	90.60

In conclusion it may be safely said that there is now open to the praphite producers of this province a market that is now absorbing $3,500,000 worth of graphite for which it is paying at the rate of $90 per ton at the point of production. This average price should easily prove profitable to the producers of the Province.

THE AMHERST GRAPHITE MINE

Written for the Canadian Mining Journal.

Although graphite was discovered in Amherst Township ten years or more ago, no systematic attempt to develop the occurrence was made until quite recently, when a large area, some 700 acres, was acquired by a Montreal syndicate, near St. Jovite, a station on the Nomining branch of the Canadian Pacific, a distance of about 80 miles from Montreal. This syndicate has made a very considerable expenditure in the last few months in developing the property, and in plant and equipment. Most of the exploration work has been done on exposures on lot 16, range 6, of Amherst Township. The principal ore-body is said to be 20 feet wide, striking north-east 65 degrees, with a dip of 60 degrees to the south. Here a vertical shaft has been sunk to a depth of a hundred feet and drifts run at 40 and 100 feet respectively. There is also an upraise from the 40-foot level to the surface, and from the 100-foot to the 40-foot level. This work has resulted in the development of a large ore suply—sufficient, it is affirmed, to justify the milling-plant now under construction. Mr. Fritz Cirkel, the syndicate's consulting engineer, thus describes the physiographical and geological conditions of the locality.

Physiographically the region is one of undulating hills, not exceeding an altitude of 300 feet, and are composed of flesh-coloured gneiss or granite. The country is dotted with little lakes connected by small creeks draining towards the south by the Maskinonge River into the Rouge River, a tributary of the Ottawa.

The principal rocks in this district are practically confined to the crystalline gneisses and limestones of the Grenville series. These crystalline limestones, gneisses and quartzites are intruded by numerous masses of eruptive rocks, such as pyroxenite, granite and less frequently by diorite and diabase. The general trend of the series is north-east. Locally, the series is contorted, dislocated and interrupted by faults which may be followed in some instances over long distances. The graphite deposits occur within eruptive rocks, striking between N.E. 62 and N.E. 70 degrees, with a dip of between 50 and 65 degrees to the east. Exploration work appears to indicate that the deposits, as yet developed on the surface, occur within a range of from 150 to 250 feet, covering a distance of over two miles. Lenticular masses and pockets of graphite varying in size from a few inches to several feet in diameter, small veins, disseminations, branches, apophyses, nests, kidneys and irregular aggregations of the mineral, together with the gangue, constitute alternatively these bandlike portions of the ore zone. Development has also demonstrated that the larger bodies occurred within certain limits and along definite zones, which suggested that

Ore Dump, Graphite Limited

mining should be carried on by shafts and drifts. The graphitic portions of the ore zone on the surface are between 10 and 12 feet wide, in some places wider, the main portion consisting of graphite scales and flakes or radiated individuals. The larger flakes, some of them one or two inches square, when freshly found are prevailingly curved, as though from pressure. They break in the direction of the platy structure into more or less angular aggregates, being composed of thin, narrow foliae of uniform width. Blocks of this almost pure graphite have been taken out measuring 1½ to 2 cubic feet. This class of ore is designated as "crude" or "cobbing" ore, and contains, according to the quantity of rock matter mixed with it, from 65 per cent. of fixed carbon and upwards. The very pure aggregates of crystals have a fixed carbon content varying between 92 and 98 per cent. A portion of this crude material was crushed to flakes, and the latter analyzed. The purity of these flakes was found to be 95.60 per cent.

The other class of ore taken from the deposits is designated as the disseminated variety, or milling ore. It is composed of streak and lense-like accumulations of flakes of the smaller size, the gangue consisting, in the main part, of feldspathic, pyroxenic rock-matter and wollastonite.

The ore of the Amherst deposits is remarkably free of these objectionable admixtures which usually impede the successful extraction of the graphite from the gandue, or render even the refined article unfit for the manufacture of most of the graphite products. There is no iron, mica, or pyrite (with its most objectionable sulphur) present, while lime remains in almost all the average tests so far made below the permissible medium, that is, below 5 per cent. Most of the graphite is

Excavation for Mill, Graphite Limited

Crude Ore, Graphite Limited

associated with feldspar or pyroxene, less frequently with wollastonite or calcite.

A selected sample containing much calcite gave, upon analysis by Prof. Chas. White, of Harvard, Cambridge, Mass., the following composition:

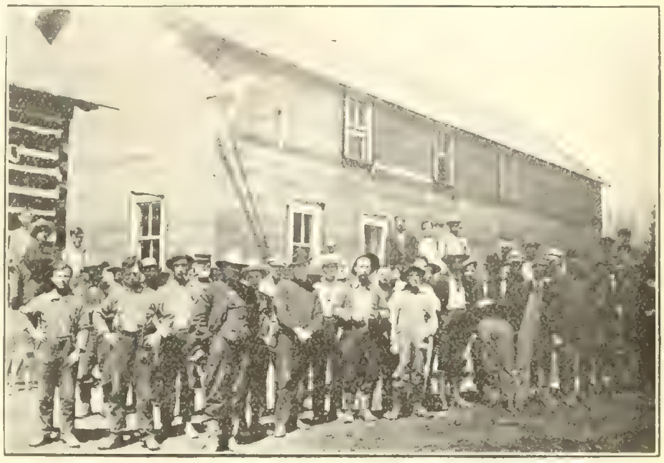
Moisture	0.3
Carbonic Acid	4.26
Other volatile matter	1.12
Free Carbon	54.75
Ash	39.74
	100.00

The mineral composition resulting then as follows:

Graphite (carbon)	54.75
Feldspar	34.32
Lime	5.42
Carbonic Acid Gas	4.26
Volatile matter	1.12
Moisture	0.13
	100.00

The Krupps, Essen, offer $150 per ton for the refined product. The machinery now being installed at the mine includes hoisting equipment, a 60 h.p. boiler, 4-drill compressor, and Cameron pump. The mill is designed to eventually treat 200 tons daily, but the present capacity will be limited to 50 tons. The mill construction is being directed by Mr. C. Brewer, whose process is to be utilized. The syndicate is employing —on mill construction and in mine development work— over a hundred men. It is expected that ere long rail facilities will be provided between Amherst and the mine by the construction of a spur from the Canadian Northern, the location of which is now being surveyed.

Graphite Limited, Shaft House to left, Mill Site to right



Mining and Construction Crew, Graphite Limited

THE SPECIAL RESEARCH WORK OF THE MINING DEPARTMENT OF McGILL UNIVERSITY

Written for The Canadian Mining Journal.

McGill was the first of the Canadian Universities to give instruction in mining and metallurgy as a regular course in 1871*, and again the first to create and equip an independent department exclusively devoted to the subject in 1896, and while several of the other important universities now also have mining schools, McGill still holds the premier place, with a staff of five professors and assistant professors, of lecturers and instructors and a dozen other employees all engaged exclusively in the departments of mining, geology, and metallurgy.

The regular work of McGill, however, is so well known that it is unnecessary at this time to describe at length either the equipment of its laboratories or the details of its courses of instruction, and all that need be said in this connection is that the University provides regular degree courses in mining engineering, mining geology, metallurgical engineering, and metallurgical chemistry, as well as in numerous other branches of science not especially related to the mining industry.

In addition to the regular business of giving instruction in the above named courses the University is now doing a great deal in the way of advanced teaching and investigation. Some work of this character has been going on for many years, as for example the extremely valuable researches of Dr. Adams and his associates on the flow of rocks, and allied matters relating to theoretical geology, but in the last few years a number of economic researches have been undertaken, the most important of which is the study of the coals of the Dominion by Dr. Paton, aided by Professor Dudley and others. The magnitude of this single investigation may be judged from the fact that a considerable staff were engaged on it for four years, and that six large volumes of reports have been printed and a seventh volume is now in preparation.

The cost of the coal research above referred to and a similar investigation now being carried on by Dr. Stansfield on the electric furnace treatment of zinc ores, are being met in large part by the Dominion Government, it being the wise policy of Dr. Haanel, the Director of Mines, to enlist the assistance of outside specialists in the work of developing the mineral interests of the country, but the investigators them-

* Editor's Note: Queen's University will dispute this statement.

selves are being made in the laboratories of the University by members of the staff of the Department of Mining and Metallurgy.

In addition to these special semi-public investigations the Department has for many years found time to carry out a certain number of researches on some of the many problems which are constantly arising in ore dressing, cyaniding, metallurgical treatment of ores, etc, and of late this part of the work has been greatly strengthened and extended in connection with the organization and development of the University Graduate School. The Mining Department now possesses three endowed scholarships and the Metallurgical Department one, thus making it possible to keep four picked graduates constantly engaged on research. These scholarships, or fellowships as those in mining are called, are eagerly sought for by the ablest men in the graduating classes and the successful fellows are given a full year for advanced study and investigation clear of any conflicting obligations.

These research fellowships have proved most useful in more ways than one, their primary object is, of course, to give advanced and specialized training to certain of the best men in each class, but incidentally all of the students in mining are helped by the work which is being done in the laboratories by the fellows, and are stimulated by their successes.

As stated above, the first object of the fellowships is educational, but the research subjects are so chosen that the results are often of great value. For example, a series of investigations has been carried on by a succession of fellows during several years on rock crushing, and the consumption of power has been very accurately measured for several standard types of crusher, working on different kinds of rock and crushing to different degrees of fineness. The result of these experiments is to finally disprove the "law" of crushing originally enunciated by Rittinger and accepted by nearly all authorities since his day, and to show that the more recent theory advanced by Kick is either true or so nearly so that it affords a close working approximation to the truth.

Kick's "law" was originally stated in 1885 as a general proposition in mechanics, and it is only within the last few years that it has been applied to ore dressing first by Stoden in South Africa, and more recently by the McGill staff. Put in terms of rock crushing it may be stated as follows: The power necessary to crush a given quantity of any given rock from any known size to any other known size, will be directly proportional to the reduction in volume of the particles —in other words have a ton of rock all in pieces say 1 inch in diameter, it will take almost three times as much power to crush them to pieces ½-inch in diameter as to pieces ¾-inch in diameter; or it will take twice as much power to crush from 1 inch to ¼-inch as from 1 inch to ½-inch.

The law as above stated is of course impractical first because it makes no allowance for the imperfections of the crushing machinery or for the difference between one kind of crusher and another, and second because it is not a practical possibility to feed a crusher with rock all broken to exactly the same size, still less to produce crushed grains all of the same size; but as Stoden has pointed out, if the law is theoretically true, it is possible to take any quantity of mixed rock, and by sizing it before crushing and weighing the different sizes then crushing say half the lot in one machine and the remainder in another, and finally by again sizing and weighing the products, it is possible to determine the relative useful work done by each machine, or in other words to determine the comparative efficiencies of different crushers.

The McGill experiments were first directed to settling the question of the truth of the theory and, as stated above, the results of a very large series of experiments agree with the law to within the reasonable limits of error of experiment on so variable a material as broken rock. The next thing to be done was to compare the efficiency of a single crusher, say a Gates breaker, over different parts of its range: i.e., to determine whether it gave as high an efficiency when working from say 4-inch to 1-inch as from 4-inch to 2-inch or from 2-inch to 1 -inch; and similarly to study other crushers such as stamps, rolls, tube mills, etc., with a view to finding the most efficient range of each machine and the comparative efficiencies of the different machines.

Obviously the amount of ground to be covered is enormous, especially as the experiments have to be carried out on a large scale yet with the utmost care to eliminate errors. Therefore, only a small part of the work has as yet been completed, but enough has been done to justify the preparation of a preliminary report which is now being prepared for publication and it is confidently believed that it will soon be possible to state with a very considerable degree of certainty just what types of crusher are most suitable for particular degrees of crushing, and to state what output may be expected for any rock for which the confines have been determined.

The activities of the research men have by no means been confined to rock crushing. The modern classifier has been investigated, and improvements which are the outcome of these tests are now in turn being tried out. The Wilfly table has been tested under varying conditions of feed. The amount of moisture necessary to give the best results in tube mills and Huntington mills has been studied. The question of heating and possible spontaneous combustion of coal in storage has been given two years of study, and a number of other matters including several geological questions have been either worked out or are now under investigation.

Another interesting and useful feature of the work at McGill is the practical class in mining which is held each year. This field class was instituted in 1897 in a very modest way, but it has grown so important until it is now one of the most effective parts of the course. As at present conducted the whole of the third year class go to the field with a supplementary party of second and fourth year students. The Professor of Mining, Dr. Porter, the Assistant Professor Mr. Bell, the Associate Professor of Geology, and from two to four junior members of the staff accompany the party and from four to five weeks of actual work are done in field geology, in visiting mines, concentrating mills, and smelters, and in underground surveying. The party lives in a train of chartered cars, sleepers, diner, and baggage car, and visit the most interesting districts in the country. In this way the Eastern Townships of Quebec, the coal and gold regions of Nova Scotia, and by boat the iron ores of Newfoundland form one year's excursion. Another year's work and it is the favourite of the students to visit in excursion Cobalt, Sudbury, the Crows Nest Pass, and Rossland in B. C.

Occasionally visits are made to the United States, thus the iron mines of Ticonderoga in New York the

Pennsylvania anthracite mines and slate quarries and the New Jersey copper smelters made one year's excursion, while Cobalt, Sudbury, and the iron and copper regions of Michigan have afforded good alternative to the British Columbia excursion above named.

It should also be explained that these excursions are but the introduction to serious work as the student members of the party are required to obtain and are aided in obtaining engagements at the mines visited for the remainder of the services and thus spend a total of over four months in practical work before beginning the studies of the final year.

The value of this practical excursion under the guidance of competent instructors, can not be exaggerated. Without it the men would have but a very vague idea of the professional side of their studies, but thanks to the field work they are able to gain a much more thorough insight both to theoretical studies and to practical work than could otherwise be possible.

THE QUEBEC CHINA CLAY INDUSTRY

Written for The Canadian Mining Journal by James G. Ross.*

One of the newest industries being developed in the Province of Quebec is the mining and refining of kaolin or china clay, which is being carried on at St. Remi d'Amherst. The bulk of the china clay used in the industries of Europe and America is produced in the West of England, principally in Cornwall. Many of the clay mines there were worked originally for tin, some as early as the reign of Henry VII. Since 1834 they have been worked for china clay. The output last year reached 750,000 tons. As only one-fifth of the amount dug is clay an immense amount of quarrying must be done to recover this amount of marketable product.

Very little first-grade china clay is produced in the United States, and that in the southern part. The majority of the clay there is of sedimentary formation and so tinted by iron oxides that it does not command the price of the pure white residual clays of Cornwall and Canada.

Washing Plant, Canadian China Clay Co.

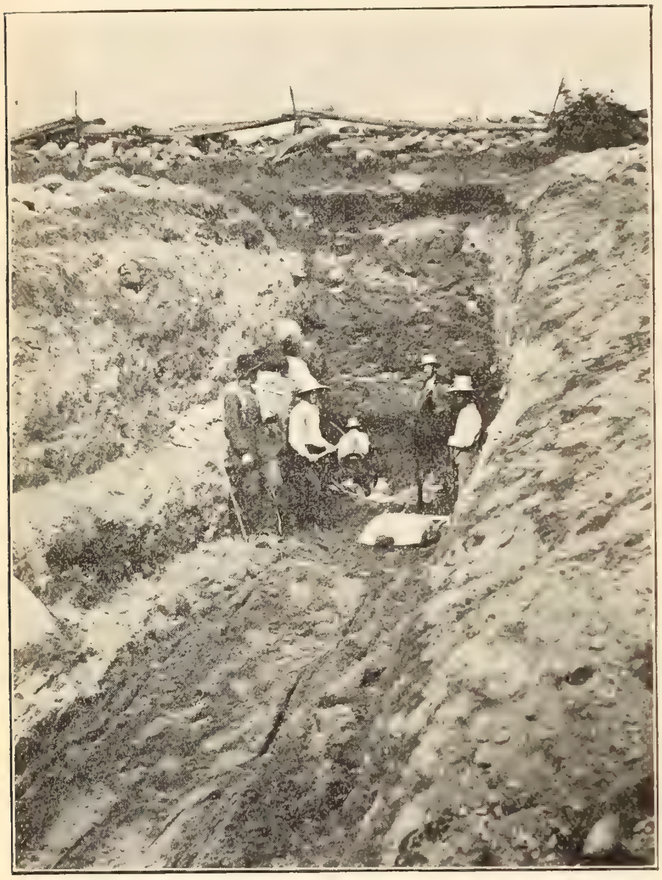
Location.

The works of the Canadian China Clay Company, the first company to operate china clay deposits in Canada, are situated two miles from St. Remi d'Amherst and seven miles from Huberdeau Station, the terminus of the Canadian Northern Quebec Railway, 94 miles north of Montreal.

In a little valley in the Laurentian Hills, surrounding Lac du Sable, after the pine timber had been cut and floated down the Maskinonge River, a settlement of habitants, mostly of the family of Tassé, grubbed the stumps and settled down to win a living from the soil lying between the rocky ridges. Some fourteen years ago in digging wells near their log cabins the settlers came on a white substance at the rock level under some twelve feet of overburden. The only use they found for it was to mix it with water and whitewash their houses.

*Mining Engineer, the Milton L. Hersey Co., Montreal.

The late Dr. R. W. Ells, of the Geological Survey, in his report on the County of Ottawa in 1901, mentioned the occurrence of kaolin on the farm of Philibert Tassé, Lot 5, Range VI. South, Township of Amherst, County of Ottawa. One F. R. Lanigan, with others, staked parts of this and adjoining farms, in all some 124 acres. The St. Remi Kaolin Company was formed, and



First Find of Clay, Canadian China Clay Co.

desultory attempts at prospecting made. Trenches were started but were not carried deep enough to uncover the rock. No further work was done until 1910 when several pits were dug disclosing clay in so many places that a French engineer was led to report the presence of a bed of it. A shipment of several tons was made to Montreal, an experimental washing trough erected in the lumber yards of Mr. A. Shearer, and samples comparatively free of grit obtained. A quantity was also sent to Chicago and experiments made to refine it by air processes. Analyses and colour tests made by The Milton Hersey Company, Limited, and by others proved the St. Remi clay to be of the first grade and equal in colour to the best English China clays.

Geology.

In Cornwall the clay occurs as veins resulting from the decomposition of feldspar in situ in pegmatite granite. Collins, an English clay authority, describes them as "areas of irregular form, generally much elongated and extending to an unknown depth. Many beds of it extend for a distance of a quarter of a mile or even more, in the direction of the veins, while their breadth may be only a few inches, and seldom exceeds one or two fathoms; very wide masses of it are wrought in many places, but these are invariably associated with groups of parallel veins."

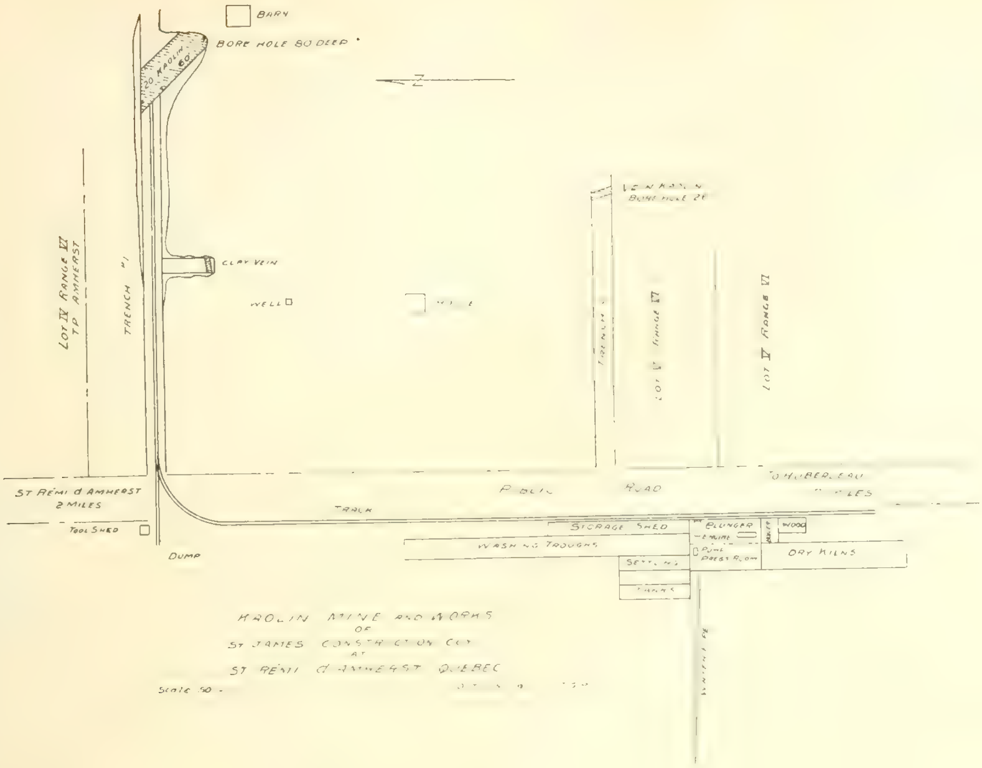
The occurrences at St. Remi bear a striking resemblance to this description. The veins are in a quartzose gneiss, one of the first veins struck, however, had a width of eighteen feet, thus being greater than the maximum width mentioned by Collins for the Cornish veins. The veins so far uncovered have a strike N.W.-S.E. along the easterly side of hill. Higher up the hill to the east the gneiss is less friable, and contains only specks of clay. This seems to be also a characteristic of the English rock on the higher levels. Across a valley to the west is an outcrop of crystalline limestone containing flakes of graphite and mica.

Operation.

Messrs. Andrew Shearer and J. C. Broderick having obtained a lease of the property from the St. Remi Kaolin Company formed a company in Montreal to operate the deposits. In June, 1911, the writer examined the properties and prospecting was commenced by digging two trenches easterly into a side hill in a cultivated field. From a preliminary investigation the conclusion was reached that the deposits were veins of

Boring a Vein of Kaolin

kaolin and not beds as formerly supposed. In the southerly trench rock was first exposed showing the formation to be a gneiss composed almost wholly of a quartzose rock with fine lines of kaolin. The lines of kaolin gradually widened until a vein four feet in width was crossed. This vein was evidently a decomposed feldspar and carried only five per cent of quartz grains. A 2½-inch bore-hole was sunk in this vein to a depth of thirty feet and was still in good clay when stopped. About this time a larger vein was struck in the northerly trench which on crossing developed a total width of eighteen feet. Bore-holes were sunk in



this to a depth of 80 feet, and the bottom of the deposit not reached. The dip of the vein was almost vertical and the strike N.W.-S.E. Several smaller veins ran parallel to it, separated by stringers of rock. The vein was uncovered along its length for a distance of 60 feet. Several other occurrences have been found on the property in wells and pits but have not yet been developed.

Plant.

Before laying out a plant for refining the clay a study was made of the processes in vogue in England, where a large quantity of raw material is treated to secure the china clay. As the drying is effected partly by natural evaporation, large open-air vats are required. As it was intended to work the year round at St. Remi provision had to be made for the winter weather here. Clay washing plants in the Southern States were visited and the method of extracting the surplus water from the clay by means of filter presses was found to be working satisfactorily. As every clay requires a different treatment experiments were conducted until a system suitable for this clay was devised. The style of plunger, mesh of screens, quantity of water, length, depth, width and pitch of elutriation trough, size of settling tanks, design of filter press, weight of duck, and design of dry kiln, all had to be considered. These features having been decided, a plant was designed which proved satisfactory, and after the usual delays incident to the establishment of a new industry, in April of this year, the Canadian China Clay Company had the satisfaction of producing a china clay of superior quality and colour, free from grit. An analysis of the clay produced, as determined by the Milton Hersey Company, Limited, is as follows:—

Silica	44.43
Alumina	40.48
Oxide of Iron	0.039
Lime	0.24
Magnesia	0.36
Sulphuric Anhydride	None.
Combined Moisture, Carbon Dioxide and Organic Matter	14.46
Residue on flotation test	Trace.

Dana gives the composition of china clay or hydrous silicate of alumina as: Silica 46.40, alumina 39.70, water 13.90.

Another View of Washing Plant

Fairie gives the following description: "China clays possess very characteristic properties. They are of a loose earthy texture, and light, friable in the hand, meagre to the touch, and do not readily form a plastic paste with water. Their composition is different in different localities, the limits being very wide. The following analysis is that of their average composition":—

Silica	46.32
Alumina	39.74
Oxide of Iron	.27
Lime	.36
Magnesia	.44
Water	12.67
Loss	.20

Process.

The clay is mixed by digging, no chilling or blasting being necessary, trammed 600 feet to the plant, washed free from grit, and allowed to settle. After the filter presses have extracted the surplus moisture it is dried in the open air in stacks. Dry kilns are being built for drying in the winter and wet seasons. After drying it will be pulverized and bagged for shipment.

Uses.

China clay is used largely in the manufacture of porcelain and chinaware. Tests made of the St. Remi clay at the potteries of East Liverpool, Ohio, show it to be equal to the best English china clay for this purpose. The largest use in Canada is for coating white papers. The beautiful white colour of this clay and the proximity of the works to the Canadian paper mills ensure a market for the output for some time for paper making alone. It is also used in the textile industry for sizing and bleaching calico and cotton, in the rubber industry and in paint manufacture as extender; for making high tension and ordinary electric insulators, chemical apparatus, and for refractory ware, such as crucibles and other assaying apparatus.

By-product.

The quartz grains produced as a by-product, which assay 99.60 per cent. silica may be used in the manufacture of glass, in making carborundum, and in filter plants.

UNGAVA

By Theo. C. Denis, Provincial Superintendent of Mines.

On May 15th, 1912, an order-in-council officially extended the boundaries of the Province of Quebec, in accordance with a bill passed previously by both Houses of Parliament of the Federal Government. Quebec has now jurisdiction over Ungava, and thereby the area of the province has been increased from 351,000 square miles to 708,000 square miles, or more than doubled in size.

Ungava is the "hinterland of the hinterland" of the Province of Quebec, and as such is, of course, very little known. Our knowledge is limited to the shores of Hudson Bay and James Bay, which have been explored to some extent; hasty traverses also have been made of some of the principal streams heading in the elevated land of the interior, which once was the nevé gathering ground or distributing centre of the Labradorean ice sheet, the activities of which extended radially for hundreds of miles.

It is to Dr. A. P. Low that we are indebted, deeply indebted, indeed, for practically all we know concerning Ungava. As a field-officer of the Geological Survey, he carried on several scientific explorations in this territory, and his maps and reports are models of lucidity, as well as a tribute to his power of observation, his endurance and his modesty.

Low's explorations in the interior of the northern part of Labrador peninsula embraced the following streams which are given with approximate distances of the routes travelled. The report and maps bearing on this work were published as Part L. of the annual volume of the Geological Survey for 1895:

East Main River, about 400 miles.

Koksoak, Kaniapiskau Rivers, and Lake Nichicun, about 600 miles.

Hamilton Inlet, Hamilton and Ashuanipi Rivers and long series of lakes in the central part of the peninsula, over 600 miles.

Big River, Bishop Roggan and part of Great Whale Rivers, 250 miles.

Richmond Gulf, Still Water and Larch Rivers, 300 miles.

An idea of the energy and physical endurance necessary to carry on that work may be had from the fact that in one campaign of seventeen months, which necessitated wintering on Hamilton Inlet, Low's party travelled 5,460 miles, of which 2,960 miles in canoes, 1,000 on foot; 500 with dog teams, and 1,000 in a steamer.

Physical Features.

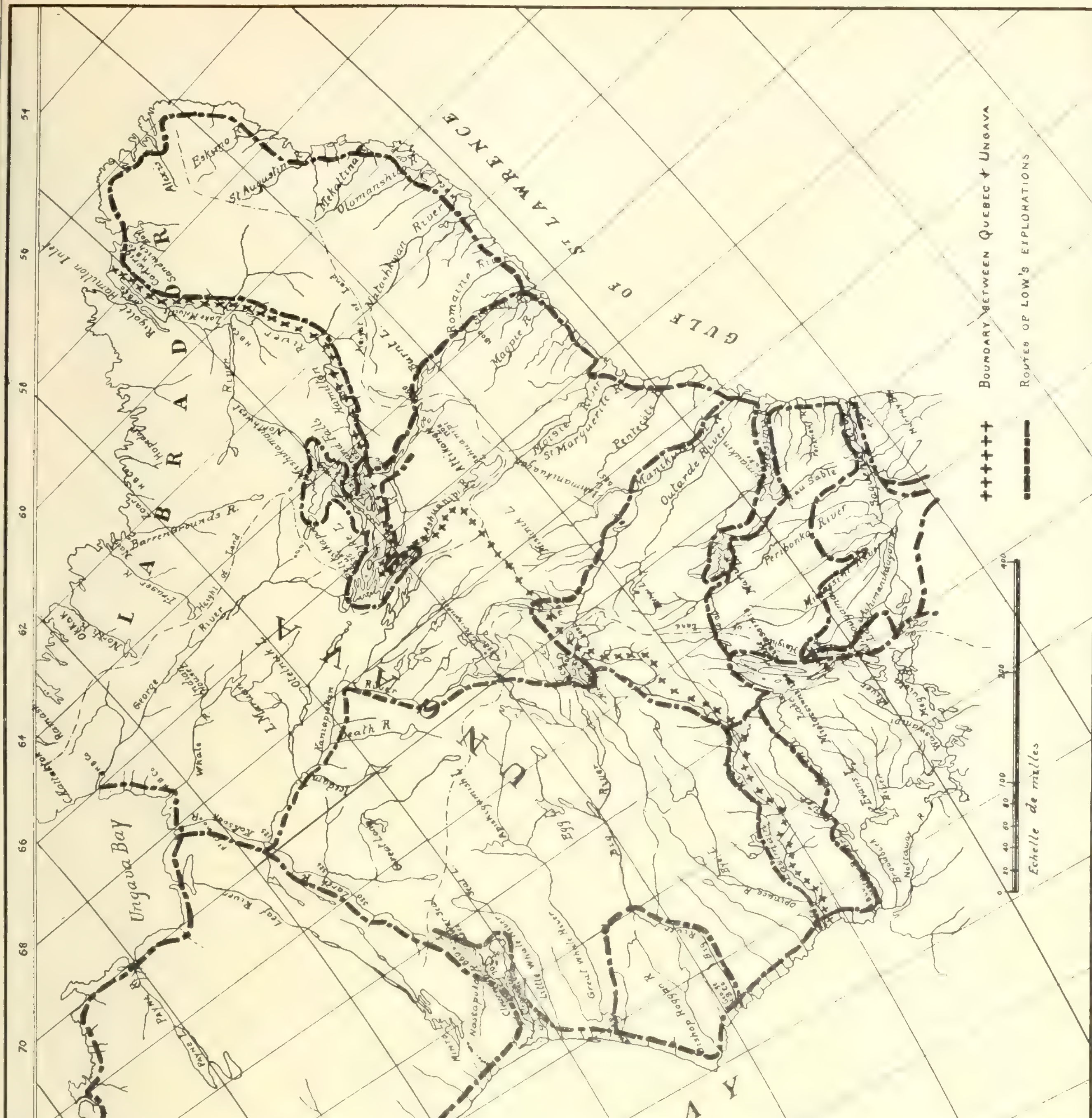
According to Low, the peninsula of Labrador is a high rolling plateau which rises somewhat abruptly, within a few miles of the coast line, to heights between 1,300 and 2,000 feet. The interior country is undulating and is traversed by ridges of low hills.

Along the Atlantic coast, however, the land rises abruptly, inland, and to the northward of Nain, the coast range is much higher. In the neighborhood of Nachoak Bay, unglaciated mountains rise abruptly from the sea to heights varying from 2,500 to 4,000 feet. This range appears to be confined to the coast region and is probably under fifty miles in width.

Geology.

By far the greater part of the country is underlain by Laurentian gneisses. A large area of Huronian rocks is met with on the East Main River from a few miles above its mouth, for 160 miles. This is the most extensive development of these rocks encountered on the peninsula. Other smaller Huronian areas have been described by Dr. Bell as occurring between the East Main and Big River. Low also observed a small patch of these rocks on Great Whale River.

Two large patches of Cambrian rocks are mentioned in Low's reports. One on the Koksoak River and another on the Upper Hamilton. It is possible and even probable that these two areas will be found on further investigation to be one continuous belt, which in that case would be 400 miles long. In one place, the width was ascertained to be about 50 miles. The rocks constituting this belt are slates, dolomites, sandstones and siliceous iron beds. Although they are indicated as Cambrian on Low's map, later petrographical correlation would tend to classify them in upper Huronian.



QUEBEC ADDED TERRITORY

corresponding probably to the Keweenawan of the Lake Superior region.

Climate, Soil and Trees.

The climate ranges from cold temperate on the southern shares to arctic on the Hudson Strait. In the territory which has just been added to the Province of Quebec, it is only on the low grounds, near the coast, that a little agriculture can be carried on. Along the

east coast of James Bay crops of potatoes and other roots are grown as far north as Fort George, latitude 54°. On the Atlantic coast, similar crops are easily cultivated about the head of Hamilton Inlet. At Nichicun, several attempts have been made to grow potatoes, but without success, owing to summer frosts in July and August.

The soil of he greater part of the peninsula is derived from the underlying archean rocks. It is a mixture of clay and sand, this latter predominating. The soil covering the area of Cambrian rocks is made up of the debris of limestone, shale and other rocks of this formation. It is heavier and supports a better growth of trees.

The forest is continuous to between latitudes 52° and 54°, with the exception of the summits of rocky hills. To the northward of latitude 53°, the size and number of barren areas increase rapidly. In latitude 55°, more than half the surface is treeless.

The black spruce, Picea Nigra, is the most abundant tree and constitutes 90 per cent. of the forest. On the southern water shed, the growth is very thick, so that the trees rarely reach a large size. To the northward the trees are more in open glades, where they spread out with large branches resembling the white spruce.

White spruce, Picea Alba, is found throughout the wooded area of the pensinsula. Along the Koksoak River, between Eaton canon and the forks of the Still Water, trees 18 inches in diameter and fifty feet high were seen. About Hamilton Inlet white spruce is abundant. The other trees which grow in Ungava are canoe birch, aspen, balsam, poplar, cedar, banksian pine, tamarack, but none of these attain large diameters.

Fisheries.

According to Low, the numerous large lakes of the several water-sheds and most of the rivers, especially those flowing north and east, are stocked with an inexhastible supply of food fishes of large size and superior quality, including, among other species, the lake and brook trout, land-locked and sea-run salmon, whitefish, pike, pickerel and ling or fresh-water cod.

Very little is known officially or otherwise, concerning the fisheries of that great inland sea, Hudson Bay, and a great amount of wealth may be lying dormant in its waters, from lack of knowledge concerning its fisheries.

Economic Minerals.

Gold.—In his report, Low mentions that he did not actually observe the presence of gold along the routes followed; but that it may occur in the numerous small quartz veins which cut Huronian rocks carrying iron and copper pyrites, when close to the eruptive masses penetrating this formation. The shales of the Keweenawan formation are also cut by numerous quartz veins, often highly mineralized. Circumstances and time did not permit Dr. Low of doing any systematic panning of gravels in these areas.

Since then rumors have been current that extensive rich placer ground has been observed in the region of the head-waters of the Koksoak and Hamilton Rivers. Although there is no confirmation of these reports, such tral gathering ground of the great Labradorean or Laurentian glacier, and, therefore, it was not subjected to such an active glacial erosion as the rest of the surface of the country, and there is more chance of finding occurrences are not unlikely. This region was the cenpre-glacial gravel deposits undisturbed.

Silver.—Dr. Bell, in the report of the Geological Survery, 1877-78, mentions the occurrence of argentiferous galena in a band of magnesian limestone which was traced along the coast from Little Whale River to Richmond Gulf, a distance of 17 miles. At Little Whale River, several years ago, the Hudson's Bay Company made an opening, but work was abandoned.

Iron.—Occurrences of iron ores are numerous, more especially in the rocks of the Cambrian. The ores are associated with a cherty limestone, which is widespread, being met with on the east coast of Hudson Bay, along the Koksoak River and on Hamilton River. However, according to several analyses of samples collected by Low, these iron ores are rather low grade and would require concentrating before smelting.

Besides the above, there are deposits of titanic iron ores in the anorthosite areas; iron pyrites on East Main River, and Wabamisk River; at Shale Chutes; on the Hamilton River and at several other places; anthraxolite on Petitsikapan and Memhek Lakes at the head of Hamilton River; mica has been observed in large crystals on East Main River; on Lake W[illegible].

Recently, there also have been reported finds of diamonds, said to have been made in the drift of the bank of a river, in some indefinite part of the "North Country." No definite information concerning these finds is available beyond the fact that some eight stones, averaging half a carat, were submitted to the firm of jewellers, Henry Birks & Sons, of Montreal, and were pronounced to be diamonds with a water-worn appearance.

It is interesting to note that a transportation company, "The Hudson Bay Steamship Line," Canadian Express Building, Montreal, is inaugurating a steamship service by "SS. Boethic" between Montreal and Hudson Bay ports. The first sailing will be from Montreal on July 2nd. Additional sailings are intended in August and September. The steamer will call at Port Churchill, Port Nelson and Port Nottaway. Such a service will be a valuable help to explorers and prospectors.

THE MAGNESITE DEPOSITS OF GRENVILLE TOWNSHIP, QUEBEC

By Harold J. Roast, F.C.S.

The magnesite deposits of Eastern Canada differ essentially from other known deposits of the world, in that they appear to have a sedimentary and not igneous origin, and also in the fact that they are crystalline, not amorphous.

At present the chief sources of magnesite are: Greece—in the Island of Euboea-Hungary, California, and Venezuela; while extensive deposits have been found in South Africa, others in Australia and Russia.

In appearance the Canadian magnesite is not unlike coarse-grained marble consisting of pure white translucent crystals capable of taking a high polish

Magnesite Working, Calumet.

The specific gravity varies from 2.9 to 3.0, eleven cubic feet-making one ton. On calcining the rock the pieces remain intact both as to size and shape, but have an apparent gravity of about 1.4 to 1.5, the actual gravity of the pulverized calcined product is approximately the same as the crude article.

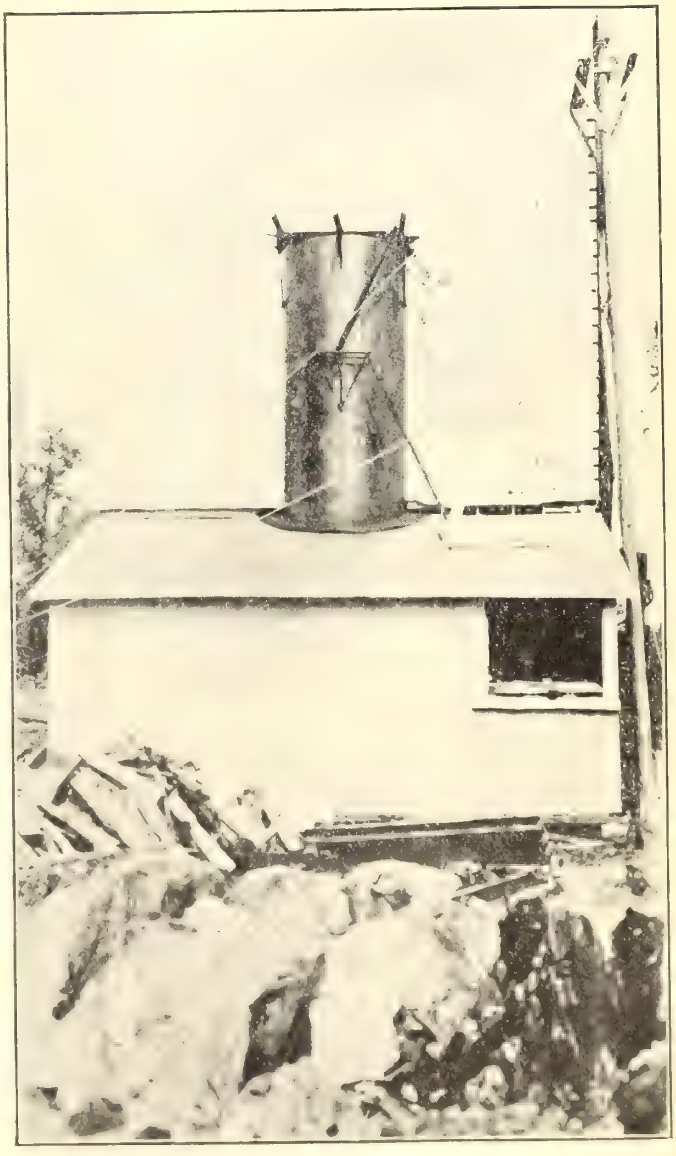
Magnesite is used amongst other things for refractory purposes, such as furnace linings and bricks; for flooring, and in the manufacture of sulphite pulp. In these cases the calcined product is required. For refractory users, the calcining is carried to the point of shrinkage or dead burning. A portion of the carbonic acid gas given off on calcining is used for the manufacture of liquid carbonic acid gas.

Other smaller uses exist, such as the manufacture of Epsom salts and magnesia alba, etc. The only deposits at present being actively worked in Canada, are situated in the Township of Grenville, a few miles north of the Ottawa River. These mines are controlled by the Canadian Magnesite Co., Limited, of Montreal. Considerable work has been done on the property. A large outcropping has been cleared and drill holes sunk to a considerable depth, showing in all cases a solid deposit of magnesite. The results obtained by such prospecting have justified the erection of a kiln. This kiln is now in operation. The rock is mined out on the open quarry system, being picked up by a grab bucket on to an aerial cableway and hoisted to the top of the kiln and dumped automatically therein. The kiln works on the principle of a lime kiln, fired with wood, the calcined product of a lime kiln, fired with wood which carry it either to the storage bins or direct to the pulverizing plant. The calcined magnesite is finely ground and packed into barrels ready for shipment. A large quantity of crude rock is also shipped for use in the manufacture of carbonic acid gas.

The company has erected substantial buildings for the men and horses, also a well equipped blacksmith's shop and hoisting house.

There is a suitable laboratory, where regular and systematic testing of the various products is undertaken.

Along with the question of mining, the company is pursuing a thorough system of prospecting, the idea



The Kiln at Calumet, Canadian Magnesite Co.

being to map out the whole property as to quality of the rock in order that material of any desired composition may be mined when required.

Other deposits have been worked to a small extent by the company which show the presence of very good material, but only one calcining unit has at present been erected. The property is well wooded, so that all heavy lumber required for the various buildings is to be found in situ, as well as a plenteous supply of fuel. A supply of good water is assured by the lake adjacent to the kiln. Owing to the small amount of surface dirt on the deposit, mining can be conducted very cheaply. All the material shipped is carefully analyzed and graded in order to ensure a uniform product to each customer. Some difficulty has been experienced in the discrepancies occurring between various analysts as to the lime and magnesia contents of the calcined magnesite. A standard method has now, however, been worked out by which very concordant and speedy results are obtained. Both lime and magnesia can be estimated within three hours of receiving the sample, the lime determination alone taking half an hour.

The composition of the rock as ascertained by the laboratory of Dr. Donald, Montreal, is:

Silica	2.00	per cent.
Iron and alumina	1.00	"
Lime	9.00	"
Magnesia	40.00	"
Carbonic acid gas	47.50	"
Water (combination)	0.50	"

By a special method of treatment, this rock is made to give equally good results with the Grecian article.

A considerable market has already been found for the calcined material both in Canada and the United States.

The material has also been well received in Europe and arrangements are being made for regular shipments thereto.

All the present indications point to a growing demand for Canadian magnesite and a rapidly increasing development of the deposits and of the uses to which the product can be put.

THE MARBLE INDUSTRY IN QUEBEC

Until quite recently the greater part of the marble and other ornamental stone used in Canada has been imported, and there has been little attempt to develop or utilize our own valuable resources, although the occurrence of marbles of fine quality in both Quebec and Ontario has been long known. In Quebec, however, a beginning in this direction has been made and there are now two marble quarries in active operation, one at South Stukely and the other at Philipsburg, in the County of Missisquoi.

The South Stukely quarry is owned by the Dominion Marble Company, of Montreal. The marble is of superb quality and extremely decorative. The quantity, it is affirmed, is practically unlimited.

The stone is dense and fine grained, having a very low ratio of absorption and taking a high durable polish. The ground mass is of a creamy white, and this is mottled and varied with a variety of tints, the prevailing colors, however, being violet and green. The violet shades off into mauve and purple, with the nicer tints of the grape and the plum. The greens range through sap green to oxide of chrominum and terre verte. This coloring is limited to bold veinings and crowdings, the cream white largely prevailing. It is, therefore, of a light marble pronouncedly decorative in effect. The foreign marbles that suggest themselves for comparison are Fleur de Pecher, Breche Violette, Breche Stazzema and Pavonezza. All these, however, from the Carrava region, are brecciated marbles. The South Stukely marble is not a breccia, but a dense, solid formation with the coloring matter an integral part of the ground mass. This means a graceful flowing pattern and a natural blending of colors, rather than the almost artificial building up of broken fragments characteristic of a becciated structure.

The quarry is situated about a mile and a half from South Stukely station on the Canadian Pacific Railway. The opening is on a side hill and is very convenient for operation. The present equipment consists of three channeling machines, but a number of additional ones will be installed at once, as soon as the development work permits. The unusual soundness of the deposit for a colored marble must strike every visitor. Merchantable blocks were taken from the first floor. On the second floor there is scarcely a seam to be found, while from the third floor, now being cut, it will be possible to take blocks of any size.

The analyses and tests that have been made show that the marble is of great purity and strength. The carbonate of lime runs to 90.58 per cent., and the magnesia 6.91 per cent. The silica is only 1.18 per cent.; oxide of iron, 39 per cent., and alumina .98 per cent. A three-inch cube withstood a pressure of 134,000 pounds, equivalent to a resistance to compression of 14,440 pounds per square inch. The Canadian Inspection Company, Limited, of Montreal, which made the analyses and tests, adds to its report this opinion: "We would judge that it would not be only a very suitable marble for interior wainscoting, etc., but could also be

View of Missisquoi Marble Quarry

used externally where it would be exposed to the weather."

The Dominion Marble Company, Limited, has completed a fine modern sawing mill and finishing plant at Cote St. Paul, one of the suburbs of Montreal. A most convenient site has been chosen. It is directly conected by siding with both the Grand Trunk and Canadian Pacific railways and an electric tram line, that carries freight runs right by the door. The mill is a substantial, fireproof structure of brick. It is run with electric power, not generated on the ground, but obtained from one of the big power companies. There is also a complete and powerful steam plant installed that can be used if desired. The stone-working equipment is furnished by the Lincoln Iron Works, of Rutland, Vt., and consists of six gangs of saws from 9 to 12 feet; three rubbing beds, two of 12 feet and one of 14 feet; three Jenny Lind polishing machines; two large blocking machines; two carborundum machines, one large and one small; two lathes and a planer. The plant is so arranged that additional equipment can be installed without trouble as it may be desired. A powerful air compressor is provided for the operation of pneumatic tools. The blocks of stone are handled by a 25-ton travelling crane of 50 ft. span, 24 ft. lift, and 150 ft. run.

The fine quality of this marble has been already recognized by Canadian architects, and it is satisfactory

Lime Kiln in process of construction at Missisquoi Marble Quarry

to learn that it is to be employed in the interior decoration of a number of important metropolitan buildings now in course of construction, not only in Montreal, but in Toronto, Winnipeg, and other cities even more distant. The marble in the recently completed Chateau Laurier, at Ottawa,—probably the finest hotel in Can-

Dominion Marble Quarry, South Stukely, Quebec

ada—is also from the South Stukely quarries. The Missisquoi Marble Co. has the distinction of being the first enterprise of its kind in Canada. It was established in 1907 in a small way, but now employs 200 men. This marble has been used in the interior decoration of the new Central Station at Ottawa, in the Transportation Building at Montreal, in the Union Station at Winnipeg, and in the Parliament Buildings, now in course of erection at Edmonton.

The mill is equipped with eighteen gang saws, and in the adjoining finishing shop are four rubbing beds, polishing beds, etc. Crushed marble from this quarry is also supplied for "terrazzo" flowing, while the quarry waste is to be converted into carbonate of lime.

QUEBEC BUREAU OF MINES.

Excellent work has been done by the Quebec Bureau of Mines, since the appointment of Mr. Theo. C. Denis to the superintendency in 1910. Mr. Denis, it is but fair to state, has been given every facility in the conduct of the Department, and in undertaking the special work that he has initiated during the past years, as a result of the confidence placed in him by the Minister of Mines, the Hon. C. R. Devlin, who has done more than any of his predecessors in office to promote the welfare of the industry in the Province.

During the summer of 1911, two field-parties were sent out by the Bureau. One of these, in charge of Dr. J. A. Bancroft, Professor of Geology at McGill University, mapped out the geology of an area south of the National Transcontinental Railway, in the vicinity of Keewagama Lake. Dr. Bancroft paid particular attention to the district of Keekeek and Wabaskus Lakes, where reported discoveries of gold caused an influx of prospectors last spring. Dr. Bancroft will continue this same work to the east of the map sheet which he covered last year, and a fuller and more detailed report, embodying the results of the two seasons' work will be issued by the Department in due course.

Another party, in charge of Prof. E. Dulieux, of L'Ecole Polytechnique, of Montreal, began an investi-

gation of the iron resources of the Province of Quebec, with special reference to the deposits of titaniferous ores, of which very extensive occurrences are known in several localities.

During the summer Professor Dulieux investigated the iron sands of the north shore of the lower St. Lawrence. These investigations will be continued this year.

Last autumn Mr. J. H. Valiquette visited the quarries in and near Montreal and surroundings.

The permanent technical staff of the Mine Branch is as yet very small, consisting of the Superintendent of Mines and one assistant, Mr. J. H. Valiquette. As the latter accompanied Dr. Bancroft's party during the whole of the field campaign, and, moreover, spent some time in Montreal, on his return from the field, to help in the working up of the results, and in the preparation of the maps, it devolved upon the Superintendent of Mines to inspect the mines, to investigate several reported mineral finds, to prepare the annual report and see both the French and the English editions through the press; attend to the publication of the reports of the Chibougamau Commission, and of the report on the Geology of Fabre Township; carry on the technical correspondence and answer numerous enquiries on our mineral resources, and to keep in touch in general with the mining industry of the Province. In addition, he was obliged to devote some time in co-operation with the Deputy Minister and the Secretary of the Mines Branch in the settlement of various questions arising from disputes on mining claims, which, in some cases, required investigations in the field. The office of Superintendent cannot, therefore, be regarded as a sinecure.

ELECTRIC SMELTING OF TITANIFEROUS ORES

By Dr. Alfred Stansfield.*

In view of the recent developments in the uses of titanium there is a considerable probability that some of the extensive deposits of titaniferous ores in Canada, not to mention the deposits of these ores in Newfoundland which are stated as being "enormous", may in the near future be utilized for the production of pig-iron or steel or for the manufacture of ferro-titanium. The following general statement may be made in this regard:—Ores that are high in titanium, containing perhaps 30% to 35% of titanic acid, are used for the manufacture of ferro-titanium, which is now very widely employed for the improvement of steel and as an addition to iron in the foundry. Inasmuch as the proportion of alloy employed is not very great, this use of titanium, although extensive, only provides for a limited consumption of titaniferous ores, and many of the Canadian ores are too low in titanium to be suitable for this purpose. Titaniferous iron ores are known to be unsuitable for smelting in the iron blast-furnace, mainly on account of the refractory slags which are formed; but the experiments of Dr. Haanel at Sault Ste. Marie have shown that titaniferous ores can be smelted satisfactorily in the electric furnace. It is well known that the iron obtained from such ores is better than iron obtained from non-titaniferous ores.

The possibility of smelting titaniferous or other ores, electrically, depends on the cost of electrical power, charcoal, etc., and the matter can only be definitely determined for any locality, after a careful consideration of many factors. It may be mentioned, however, in this connection, that the figures reported from Sweden with regard to the smelting of magnetite ores at Trollhattan, show that these require about 0.27 electrical horse-power-year and 0.34 ton of charcoal for the production of one ton of pig-iron. These two items might be held in a general way to replace the cost of the coke, or charcoal in ordinary blast furnace practice, and a comparison could therefore be made when the prices of power and charcoal were known. One should consider, however, that, as titaniferous ores are unsuitable for the blast furnace, they would command a lower price, and this would be an argument in favor of their treatment in the electric furnace; moreover the pig-iron obtained from such a furnace would be better, in certain respects, than pig-iron obtained from a coke blast-furnace.

Although the possibility of the electric smelting of iron ores for pig-iron cannot be definitely settled in a general way, there appears to be every probability that a process which yields steel instead of pig-iron would be commercially possible in favourable localities. Steel could be made by smelting titaniferous iron ores in an electric furnace with a somewhat smaller amount of charcoal than would be needed for making pig-iron, and the resulting metal could be transferred in the molten condition to an electrical steel-refining furnace where it could be made into finished steel. The cost of producing the crude steel from the ore would be little more than that of producing pig-iron, and the cost of refining the steel would be only a moderate addition to this; while the price obtainable for the finished product would be decidely higher than could be obtained for pig-iron.

The writer has been associated with Mr. J. W. Evans in the development of a process in which the reduction of titaniferous ores to metal, and the subsequent refining of the steel, is carried out in a single furnace, and while the details of the furnace construction and certain parts of the operation have not yet been fully worked out, the results have been so encouraging that it appears to be worth while to develop the process on a small working scale. With regard to the results so far obtained it may be stated that titaniferous ores obtained from the Orton mine, and containing about 7 per cent. of titanium, have been smelted directly to steel, and that such steel, containing about 1 per cent. of carbon, has been found to possess unusually good qualities as a tool steel. The cost of smelting these ores, and refining the steel, can be determined fairly accurately from the figures published in regard to the electrical smelting of iron ores to pig-iron and the electrical refining of molten steel. These figures are more dependable than data obtained from the small scale experiments that have so far been made. The writer intends, however, in the near future to make further experiments on the reduction and refining of the steel in order to obtain direct information as to the cost of the process.

*Professor of Metallurgy, McGill University, Montreal.

In regard to the refining of steel obtained in this man-r, it may be pointed out that in ordinary steel mak-g, the blast furnace serves to remove the sulphur con-ined in the ore and fuel, and that the phosphorus, hen present in the ore, is removed in the steel furnace ith the aid of a limey slag. In the direct process for aking steel the removal of phosphorus and sulphur is fected in a different order. The phosphorus is remov-l in part during the smelting of the ore, because the ag retains some oxide of iron. Very little sulphur is emoved during this process, but in the final stage it is asily removed by means of a limey slag in the strongly educing conditions of the electric furnace. In making eel it will probably be desirable to use specially pure arieties of fuel, such as charcoal, in preference to coke, nd whenever possible, ores low in phosphorus. Both ulphur and phosphorus can be removed very perfectly y this process, but the removal of a considerable mount of phosphorus will probably entail the loss of ne titanium, and, therefore, in the treatment of phos-horic ores we cannot expect any special advantage rom the titanium in the ore, although such ores can, f course, be employed as well as any other ores for teel making.

There does not appear to be any definite limit, as re-ards the percentage of titanium, in ores suitable for his process; but the cost of smelting will, of course, in-rease with the proportion of titanium, both on account f the cost of fluxing it and on account of the smaller proportion of steel obtained. It seems probable, there-ore, that the process will be applied to ores that do not ontain more than 5 to 10 per cent. of titanium. Ores omewhat richer than this in titanium may be concen-rated magnetically so as to obtain a product which hall be at once richer in iron and poorer in titanium, and it may even be possible in some cases that the tail-ngs, from such a concentration process may be suffici-ently rich in titanium to be smelted for ferro-titanium. Some ores, containing too much titanium for steel mak-ng, are not amenable to magnetic concentration, and these may be smelted with suitable admixture of non-titaniferous ores. It has been found that the electric furnace is more suitable than the blast-furnace for the treatment of pulverized ores, and that magnetic con-centrates can be smelted alone or with the addition of a moderate proportion of coarser ore.

The use of titaniferous ores for making tool-steel would appear to be very advantageous commercially, but cannot be expected to provide for a large consump-tion of these ores, and it is of interest to consider whether the process can be applied to the production of steel on a larger scale. One purpose for which this process would appear to be very suitable is the produc-tion of steel castings. A good deal of difficulty is ex-perienced in the production of steel castings which can be relied upon as being entirely sound, and ferro-titan-ium is used in some cases for producing soundness in steel castings It seems very probable, therefore, that steel made directly from titaniferous ores will be par-ticularly suitable for the production of steel castings, and this will afford a larger field for the electric smelt-ing of these ores. With regard to the use of this pro-cess on a still larger scale, for the production of steel rails for example, the writer would say that there ap-pears to be no definite reason why rails should not be made by this process, but would not care to speak defi-nitely with regard to this, until the process has been in operation on a working scale.

There are, of course, in a new process many points of difficulty which will have to be overcome, such for example as the consumption of electrodes which will, no doubt, be somewhat larger than in the smelting of ore to pig-iron. The lining of the furnace will also be liable to be more rapidly corroded because the slag will be richer in iron oxide. These and other difficulties have been carefully borne in mind and the writer is hopeful that they will be overcome in the course of the development of the process and that a very important industry will be founded on the titaniferous ores of Canada.

RARE AND RADIUM-CONTAINING MINERALS IN QUEBEC.

By J. Obalski.

In the rocks of Laurentian age, widely distributed through the northern portions of the Provinces of Quebec and Ontario, are to be found many of the rarer earths and minerals, possibly in quantities that would repay research and exploitation. The metals derived from these minerals have a limited economic applica-tion, but frequently possess a considerable market value.

Occurrences so far noted in Quebec have been found in pegmatite dykes, which have been worked as pro-ducers of white mica in the Laurentian granite and gneiss. The composition of the dykes is muscovite, feldspar (usually orthoclase), quartz, garnets, beryl, turmaline in well formed crystals, magnetite and titanic iron in minute fragments or crystals, and vari-ous other minerals from which the rarer metals are obtained.

The several localities in which the rarer minerals have been found are:

Villeuve Mine, Labelle County: Beryl (a silicate of alumina) and glucinium, carrying from 12 to 15 per cent. glucinum oxide. Monazite, phosphate of cerium, lanthanum and didyminum usually containing a per-centage of thorium in the form of silicate. Uraninite, oxide of uranium. From this mineral radium is mainly derived.

Maisonneuve Mine, Berthier County: Beryl; Tam-arskite (Tantalo-niobate of uranium, iron and yttrium) radio-active. Fergusonite (tantaloniobate of yttrium) and cerium, with zirconium. The minerals occur in relatively large quantities at the Maisonneuve mine.

Pieds des Mont mine, Charlevoix County: Clevite (uranium oxide comparatively high in radium).

Garnets of a fine quality are also found in this mine. The stones have been successfully cut.

Mine in Taché Tp., Lake St. John County: Gado-linite (silicate of yttrium, lantharium, iron and glucin-ium), with metals of the yttrium and lanthanum groups.

Allanite (a silicate of cerium and yttrium).

Leduc Mine, Ottawa, County: Here has been found a variety of lepidolite or lithium mica; as well as fine specimens of both green and pink tourmaline.

Mine in Duhamel Township, Labelle County: Mona-zite, in association with thorium in small quantity.

In addition to the Muscovite mines enumerated there are numerous others in the Province that have not been investigated to determine the occurrence of rare minerals. Such investigation might well prove profit able.

Detailed reference to the occurrences will be found in the reports of the Quebec Department of Mines, and

in those of the Geological Survey of Canada, while attention is, in particular, directed to the Quebec reports on Mica published in 1901, and on Mining Operations published in 1905, and to the more recent report on Mica published by the Mines Branch of the Dominion Department of Mines. Valuable information on the subject of the rare metals will also be found in the Mineral Industry for 1902 (McGraw-Hill Pub. Co., New York).

As is generally known Thorium and Zirconium are now employed in the manufacture of mantels, etc., for incandescent lighting; tantalum, among other uses, in the manufacture of electric lamp filaments, and Uranium has valuable chemical properties.

Although the rarer minerals usually occur only in small quantities in the localities mentioned, their recovery, as a bye-product, may readily prove remunerative. At the Maisonneuve mine, for example, Samarskite occurs abundantly and should be well worth saving. Further, those now engaged in mining white mica would be well advised to note the occurrence of minerals of unfamiliar appearance and provide for their identification.

THE TITANIFEROUS ORES AND THE MAGNETIC SANDS ON THE NORTH SHORE OF THE ST. LAWRENCE

By E. Dulieux, Professor of Mining, L'Ecole Polytecnique, Montreal.

On Seven Islands Bay, on the north shore of the St. Lawrence, situated some three hundred miles from Quebec, is an active little settlement, at which the Hudson's Bay Company and Revillon Freres have established trading posts. Here a pier is now under construction—a convenience that will be appreciated by steamer passengers who heretofore have been obliged to avail themselves of friendly boats to effect a landing. Across the bay is a whale factory, and a short line of rail leading to pulp works.

Titaniferous Ores.

Reference to the occurrence of titanic iron ores in this neighborhood will be found in various official reports, and Sterry Hunt (Report of Progress, Can. Geol. Surv., 1866-69), Eels. (1888-89 Rep. Geol. Surv.) and Obalski have presented more or less detailed descriptions of the ore bodies on the Rapid River, emptying into Seven Islands Bay.

The rocky shores of the bay and the shores of the Rapid River are occupied by anorthosites and gabbros. In several places along the river, the gabbro is so heavily mineralized with titanomagnetite particles, that the rock itself has the appearance of ore. The color is black, the grain is fine, the density is heavy and after minute pulverization small particles of a slightly magnetic matter can be lifted with the magnet. But by a more careful study it is easy to observe that this so-called ore is generally too low in either iron or titanium to have any commercial value. For example, two magnectic gabbros analyze as follows:

$Si\ O_2$	14.60	11.78
$Fe\ O$	20.36	33.18
$Ti\ O_2$	9.40	18.62
$Al_2\ O_3$	12.13	8.29

On the other hand in some places, a true segregation of titanic iron ore appears in the anorthosite. The larger, which constitutes the ore bodies described by Hunt and Oblaski outcrops on both sides of the Rapid River, near the second falls, called the chutes du cran de fer. The more extensive outcrop is visible on the steep rocky slopes which rise for 70 feet above the river on the eastern side. It can be followed for 500 or 600 feet along the shore and blocks of pure ore are encountered at an elevation of 50 or 60 feet above the water level. In this deposit every transition is to be found between pure ore containing 50 to 52% of metallic iron and 12 to 15% of titanium and impregnated gabbros containing 10% of metallic iron and 2% titanium. On the other side of the river the same rocks and ores are visible. Here M. M. Molson mined some hundred tons of ore in the early times, part of which output was consigned to the Moisie furnaces.

Other outcrops of a similar ore are frequent along the Rapid River, but for the present none of them seem to be of an equal importance to that described. For the present any estimation of tonnage in sight or probable tonnage is premature. In fact the main point for determination is the economic value of ore of this character. Thus there is no advantage in knowing that there is a large available tonnage if the ore itself is not marketable.

The presence of 10 or even 15% of titanium is not a positive hindrance to the obtention of a good pig iron. In fact the small traces of titanium that are left in the metal are an advantage in the manufacture of steel, therefrom. Ordinarily, titanium would give a refractory slag, but by using suitable fluxes, and by increasing slightly, perhaps, the coke charge, all difficulties disappear. The only real objections to the presence of moderate amounts of titanium in iron ore are that it has the effect of lowering the iron content, and also necessitates a modification in furnace practice. With the gradual exhaustion of high grade iron deposits ores of this character will assuredly in time become valuable. Other similar deposits are found on St. Marguerite River, just above the pulp works and half a mile below the dam. The outcrops are very limited in extent. The ore assays from 50% to 57% iron and from 9 to 12% titanium.

The question of the transportation of these ores presents no particular difficulties. The deposit of the "Grande fer" on the Rapid River could be connected with the Seven Islands pier by an 8-mile railway. From nearby falls from 4000 to 5000 h.p. might be generated.

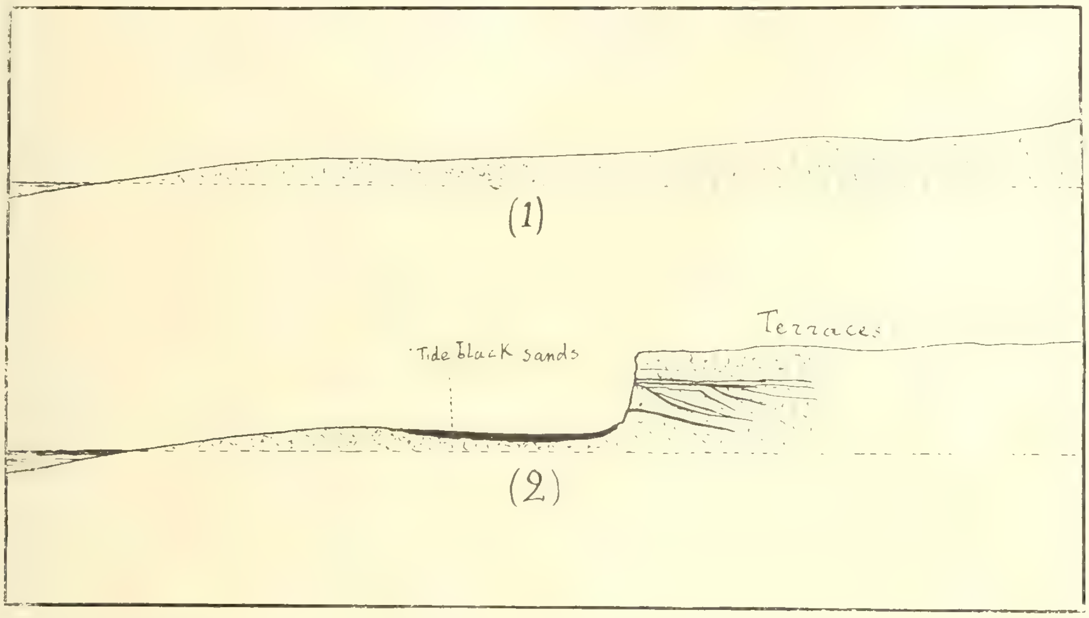
Magnetic Sands

From Seven Islands Bay to the Moisie River (20 miles) the coast is a continuous and beautiful sand beach which can be followed for a further nine miles to the east. Along the beach, and more especially on each side of the mouth of the Moisie River are irregular layers of magnetic sand. It is important to distinguish that the two entirely different types of deposits should be recognized:

(1) Tide Sands. On certain places, especially where the waves at high tides have beaten against obstacles, a layer of concentrated sand stretches on the beach. These deposits are the result of a natural concentration process. These layers are from 1 to 30 or 40 feet wide, from 1 to 6 or 10 inches deep, and are traceable for many thousand feet. Their iron content is tolerably high, as is shown by the following analyses:

	Sample. I.		Sample II.	
	Iron.	Titan.	Iron.	Titan.
Raw sand	55.82	8.43	36.42	7.49
Concentrates (by magnet)	68.76	1.80	67.17	1.46
Proportion of concentrates	48%		26%	

(2) Terrace Sands. Several terraces of Champlain age contain seams or layers of black sand intermingled with coarse or fine white sand. The discordance of the stratification suggests an estuarine or wavy origin. These layers are relatively narrow; their thickness varies from a fraction of an inch to from 4 to 6 inches. Several drill holes were put down by the author in order to ascertain the average richness of certain terraces not far from the present beach, and the results showed that for 6 or 8 feet deep the amount of concentrates may run from 4 to, on occasion, 20%, with a possible average of 6 to 7% for several thousand feet along the beach. The concentrates may contain 65% of iron and from 2 to 3% of titanium.



Sketch Showing How the Layers of Tide Black Sands Occur on Beaches at the Foot of the Terraces

There is probably available a few hundred thousand tons of tidal sand material; the possible quantity of magnetic sands in the terraces could only be determined by systematic investigation, which would envolve several months' work.

SLATE IN QUEBEC.

The known deposits of slate of commercial importance are found in the Eastern Townships, in Richmond, Bagot, Drummond, Shefford and other counties. The slate is both black and "coloured," the former being of Ordovician and the latter of Cambrian age. Quarrying in various localities has been carried on intermittently for nearly half a century, but the industry has never assumed very important proportions; although production in 1889 was valued at $119,161, promising well for that time. Unfortunately, however, this yield constituted a record achievement and since them the industry has persistently declined, while, on the other hand, slate continues to be imported in increasingly large quantities. At present no production is being made, operations at Rocksand being confined entirely to development. It is difficult to understand the reason for this inactivity, more especially as, notwithstanding the competition from the manufacture of other roofing materials, such as terra cotta, asbestos shingles, metal sheets, etc., the consumption of slate in Montreal and other Quebec cities and towns has steadily increased in recent years. The winter conditions in Quebec, of course, to some extent are a serious handicap, not only necessitating the suspension of work for perhaps six months in the year, but being the cause of much waste. Nevertheless, the proximity of the quarris to excellent markets, the protection afforded the industry by the import duty, and the fact that the local slate is of good quality and colour should afford sufficient inducement and opportunity to quarry-owners here.

Although in 1911 the slate production of the United States showed declination, the value of the output for that year reached the very considerable total of $5,728,-019, of which the quarries in the State of Vermont, adjoining our own province, contributed no less than 28.37 per cent.

QUEBEC MINERAL STATISTICS—RAILWAY SHIPMENTS

We are indebted to Mr. E. O. Grundy, General Freight Agent of the Quebec Central Railway Company, for the following returns of mineral shipments over this time for the year 1911, and for the first five months of 1912:

MINERAL STATEMENT YEAR ENDING DECEMBER 31ST, 1911.

Stations.	Brick.	Lime.	F. Stone.	Copper Ore.	Chrome Ore.
Ascot	29,837,850				
Dudswell Junction		15.547.015			
B. Crossing			211,700		
Weedon				47.985.300	
Coleraine					367.640
Scotts	4,181,650				
St. Victor	276,000				
Total	34,295,500	15.547.015	211.700	47.985.300	367.640
Tons	17,148	7.774	106	23.993	184

ASBESTOS.

Stations.	No. 1. Crude.	No. 2 Crude.	No. 1 Fibre.	No. 3 Fibre.	Asb. Sand.
Black Lake	95,000	797,000	17,660,845	4.367.550	4.668.340
Thetford Mines	3,805,100	5,197,400	55.381.770		50.596.375
Robertson				6.097.220	4.503.725
East Broughton			2.730.850	1.890.050	3.410.140
Total	3,900,100	5.994.400	75.773.465	12.354.820	63.178.580
Tons	1,951	2.996	37.886	6.178	31.589

GRANITE.

Stations.	
St. Sebastian	1.352.550
St. Samuel	103.350
Total	1.455.900
Tons	725

MINERAL SHIPPED DURING FIVE MONTHS ENDING MAY 31ST, 1912.

Stations.	Brick.	Lime.	Copper Ore.	Granite.	Asb. Sand.
Ascot	10.792.636				
Dudswell Junction		6.093.805			
Weedon			15.386.600		
Scotts	1,836.950				
St. Sebastian				450.700	
St. Samuel				80.000	
Total	12,629.586	6.093.805	15.386.600	530.700	
Tons	6,315	3.041	7.693	211	

ASBESTOS.

Stations.	No. 1 Fibre.	No. 3 Fibre.	No. 1 Crude.	No. 2 Crude.	Abs. Sand
Coleraine	112,000				
Black Lake	11,009,100	1.380,000		60.000	800.100
Thetford Mines	25,634,565		1.293.500	2.273.800	21.578.850
Robertson		160,000			590.000
E. Broughton	258.500	40,000			400.000
Total	37,014,165	1,580,000	1.293,500	2.333.800	23.268.950
Tons	18.501	790	641	1.167	11.634

ASBESTOS MINING IN QUEBEC

The following notes on the principal mines operating n the Eastern Townships are compiled from information obtained by a special representative of **The Canadian Mining Journal**, who visited the districts within he past fortnight. The views of a number of the mine managers on the industrial outlook is also incorporated.

Amalgamated Asbestos Corporation, Limited.

This recently reorganized undertaking is at present operating the King and Beaver mines at Thetford and the British Canadian at Black Lake. The early resumption of operations at the Standard mine, Black Lake, is also contemplated.

The manager, Mr. J. D. Sharpe, is hopeful regarding the future of the industry, affirming that the present demand is steady and the tendency is towards higher prices. The company produced 100.000 tons in 1911. The output this year, it is estimated, will reach 150,000 tons.

The Bell Mines, Limited.

The Bell is the only mine in the asbestos districts in which underground working has been adopted. The underground workings now aggregate over 20,000 feet in asbestos-bearing rock. The capacity of the mill is between 800 and 1,000 tons of rock a day of 24 hours, and the daily output of fibre is approximately 100 tons. The mill is at present working to the limit of its capacity. The fibre and crude produced from this mine represent 6 per cent. of the rock mined, taking also into account dead work and stripping. For stripping, a steam shovel is utilized. The company employs 420 men, whose daily wage ranges from $1.65 to $1.90. The manager, Mr. W. H. Smith, though somewhat non-committal, appeared to regard the future of the industry as hopeful, remarking that the demand was increasing, and that while as yet there had been no marked increase in prices, the tendency was upward. Shingle stock is, at present, the strong feature.

The Johnson Asbestos Company.

The Johnson mines, at Thetford and Black Lake respectively, afford employment to 300 men, and when worked at full present capacity are capable of producing from 10,000 to 12,000 tons of fibre a year, working 10 hours a day. Mr. Johnson's view of the industrial outlook is somewhat pessimistic. Prices, he points out, have shown no advance, but rather are fluctuating in the vicinity of "low water mark." The demand of late has been good and shipments heavy; but this condition is attributable to buying on the part of manufacturer with a view to accumulating large stocks at prevailing low prices. This will, in Mr. Johnson's opinion, curtail future demand. Prices now are actually from 25 to 50 per cent. below the cost of production and none of the mines are operated profitably. Mr. Johnson also considers that the present milling capacity of the mines of the district far exceeds existing market requirements. The market for asbestos products is, he affirms, very uncertain, for the popularity of such products as yet have not been established. Since, moreover, the uses to which asbestos is put are constantly changing and the distinctive requirements of individual manufacturers must be regarded, no standard of grading is possible. Even when the raw material is required for a purpose such as the manufacture of shingles the quality of fibre that will be required by one manufacturer will not suit the requirements of another, since processes differ. This also applies to paper stock and even to spinning fibre. Thus a manufacturer will ask for a fibre of a particular quality, and the order is filled, the price depending on general market conditions and the quality of product supplied, which may grade from No. 1 crude down. In consequence there is a multiplicity of grades and of prices, ranging from $5.00 to $1.00 per ton, and until there is uniformity in manufacturing processes and manufactured products are standardized, the present condition in this respect will continue.

To illustrate the market uncertainties Mr. Johnson referred to the fact that a few years ago 1,200 tons of asbestos yarn for rope and fabric was manufactured annually in the United States, utilizing for this purpose 1,800 tons of spinning fibre. The trade has since fallen off to 100 tons. Meanwhile a new use for asbestos, promising well, is in the manufacture of automobile brake linings, while fireproof packing is also a new application. Paper stock on the other hand is in less demand than formerly, the best and staple demand being for shingle stock.

The Black Lake Consolidated.

The mill at this property has a daily capacity of 700 tons of rock, and at present produces 35 tons of fibre a day, the rock thus averaging 5 per cent. fibre. Operations were carried on from May to November, inclusive, in 1911, the production during that period being 2,800 tons of fibre. Operations were resumed in April last and improvements and additions to the plant are now being made to increase its capacity. The mine production includes No. 1, 2 and 3 crude; long mill fibre of two grades; paper stock; shingle stock and low grade sands for cement and plaster manufacture.

The Martin-Bennett Asbestos Mines, Limited.

The acquisition of the Ward-Ross property, situated between the Johnson & King mines, for the sum of $710,000, by Mr. Bennett and his associates last year was an encouraging sign as indicating confidence in the future of the industry on the part of skilled and experienced men. The property, as a result of litigation, had been unworked for sixteen years, but it is nevertheless one of the most favourably situated in the Thetford district. The mill, whose capacity is 100 tons of rock an hour, or of approximaely 25,000 tons of fibre per annum, was erected last year and milling operations commenced early this spring. The rock averages about 8 per cent. fibre, and production to date has been 25,000 tons, for which an average price of $40 was obtained.

The Jacobs mine employs 425 men and is working He is our authority for the announcement that a new factory for the manufacture of shingles has been established at Calais, France, which will require raw material to the amount of from 15,000 to 20,000 tons of fibre annually. This plant differs from those producing at present in that it is operated by steam and all grading is done by means of rotary screens and crushing by gyratory crushers. Another statement of interest made by Mr. Bennett was to the effect that grading now in general in the asbestos district is from 25 to 30 per cent. higher than was the case two years ago, all grades being much cleaner and of better quality than formerly.

The Jacobs Asbestos Co.

The Jacobs mine employes 425 men and is working day and night at full capacity. From 1,500 to 1,600 tons of rock, averaging 7 per cent. fibre are treated daily in the mill. The manager, Mr. Walter R. Leventritt, gave our representative the following interesting information on the industrial situation:

In general the market is improving rapidly. The large stocks of crude that accumulates during the late period of depression have been absorbed and in the case of one company only is there any considerable quantity on hand. Stocks of all grades, in fact, have been materially reduced, being 15,000 tons less at present than at the new year. Shipments, however, during the past five months have exceeded all previous records for a like period. In May, shipments from Thetford Station averaged 27 carloads of bagged asbestos fibre daily. From January 1st to June 1st, shipments to Europe represented 260 lots, averaging each 60 tons, whereas in the corresponding period of 1911 the shipments were 158 lots, averaging 50 tons. Prices, Mr. Leventritt stated, have advanced to the extent of 25 per cent. for crude and 10 per cent. for mill fibre. Thus crude selling for $250 in 1911 has now advanced to $300, and No. 2 from $120 to $150 per ton. The production, however, of crude fibre is declining, since the older mines are not recovering so high a percentage of crude as formerly. The annual production of crude is approximately 4,000 tons, 60 per cent. of which is employed in the manufacture of linings for automobile break bands and lighting tanks.

In respect of grading, there is no uniformity of method or of result as between the individual mines. Thus the terms applied to differentiate qualities or grades of fibre are in a measure meaningless, as they signify no recognized standard of quality. Each company, however, produces several different grades under the following general heads:

1. No. 1 crude. 2. No. 2 crude—Some companies make a No. 3 crude, but the output of this grade is small.

3. No. 1 long fibre (used in Europe for spinning). $100 per ton 2,000 lbs.

4. No. 2 long fibre, formerly used for spinning, but not used largely for the manufacture of insulating material and steam packing, $65.00.

5. Long shingle stock, $45.00.

6. Short shingle stock, $27.50.

7. Paper stock (asbestos paper, air-cell steam pipe covering, mill board filling, roofing, etc.), $20.00.

8. Short, low grade for cements, plaster, flooring, etc. $5.00-$10.00.

Manifestly the prices quoted are approximations only, producers accepting orders at any price and then grade the product in keeping with the price; but usually prices are based on specifications requiring that a stated percentage of fibre shall pass through a screen of stated mesh conder agitation at a stated rate for a stated time.

Mr. Leventritt confirmed the statement of others that the demand for paper stock is declining, while that for shingle stock is on the increase, and many of the mines are now catering directly to this trade. For shingles a coarser fibre having more "life" than is necessary for paper-making, is required. There are at present seven shingle factories in Austria, ten in Germany, one in England, one in the United States and one in Canada.

Mr. Leventritt estimates that Canadian production in 1912 (exclusive of sands shipped in bulk) will approximate 110,000 tons, of which Thetford may be expected to contribute 65,000 tons, Danville, 25,000 tons; and the districts of Black Lake, Robertson and East Broughton the difference.

The Asbestos and Asbestic Co., Ltd.

Two mills are in operation at this company's Danville property, on which, also, 600 men are employed. ployed.

East Broughton.

There are in all six plants in the Broughton district, namely, those of Ling, Frontenac, Eastern Townships, Broughton and Montreal companies. None is, however, at present in operation, but negotiations are in progress for the amalgamation of the Ling, Eastern Townships and Frontenac properties. On the latter is erected the finest mill in the district, valued at $250,000, while on the Ling and East Townships are large quantities of asbestos-bearing rock of good milling quality. The Ling was the only mine operated in the Broughton district last year. Its production was 4,457 tons, the rock milled averaging from 8 to 9 per cent. fibre. The grades of mill fibre produced were:

X.—Spinning and extra paper stock, ¾ in. to 1 in. in length, $80.00.

XX.—Paper stock, ½ in. in length, $25.00.

XXX.—Slate and Tile stock, short fibre free from $9.00.

XXXX.—Short fibre cement, plaster, etc., $5.00.

The asbestos grades about 30 to 35 per cent. XX. grit and dirt, $9.00. 35 to 40 per cent. XXX, and 20 to 25 per cent. XXXX, with a small proportion of X.

The Berlin Asbestos Co. (Rumpelville).

At this company's mine 125 men are employed. The rock mined averages from 7½ to 8 per cent. asbestos. The production at present is 1,000 bags of 100 lbs. each daily. The company has no stocks on hand and is making regular consignments to Germany. Four grades of fibre are produced, namely:—

Hand-picked crude spinning fibre, $85 per ton of 2,000 pounds.

A. Mill fibre, long, 1 in. to 1¼ in., $75 per ton of 2,000 lbs.

B. Paper stock, ½ in. fibre, $19 per ton of 2,000 lbs.

C. Short, for cheap paper, plaster, etc., $6.50 per ton of 2,000 lbs.

Of 500 bags, 10	graded	spinning.
28	"	A
200	"	B.
262	"	Short.

Mr. Walter Rumpel, the manager, expressed the opinion that the market was improving, that stocks were low and that the general outlook was more favourable than for some time past.

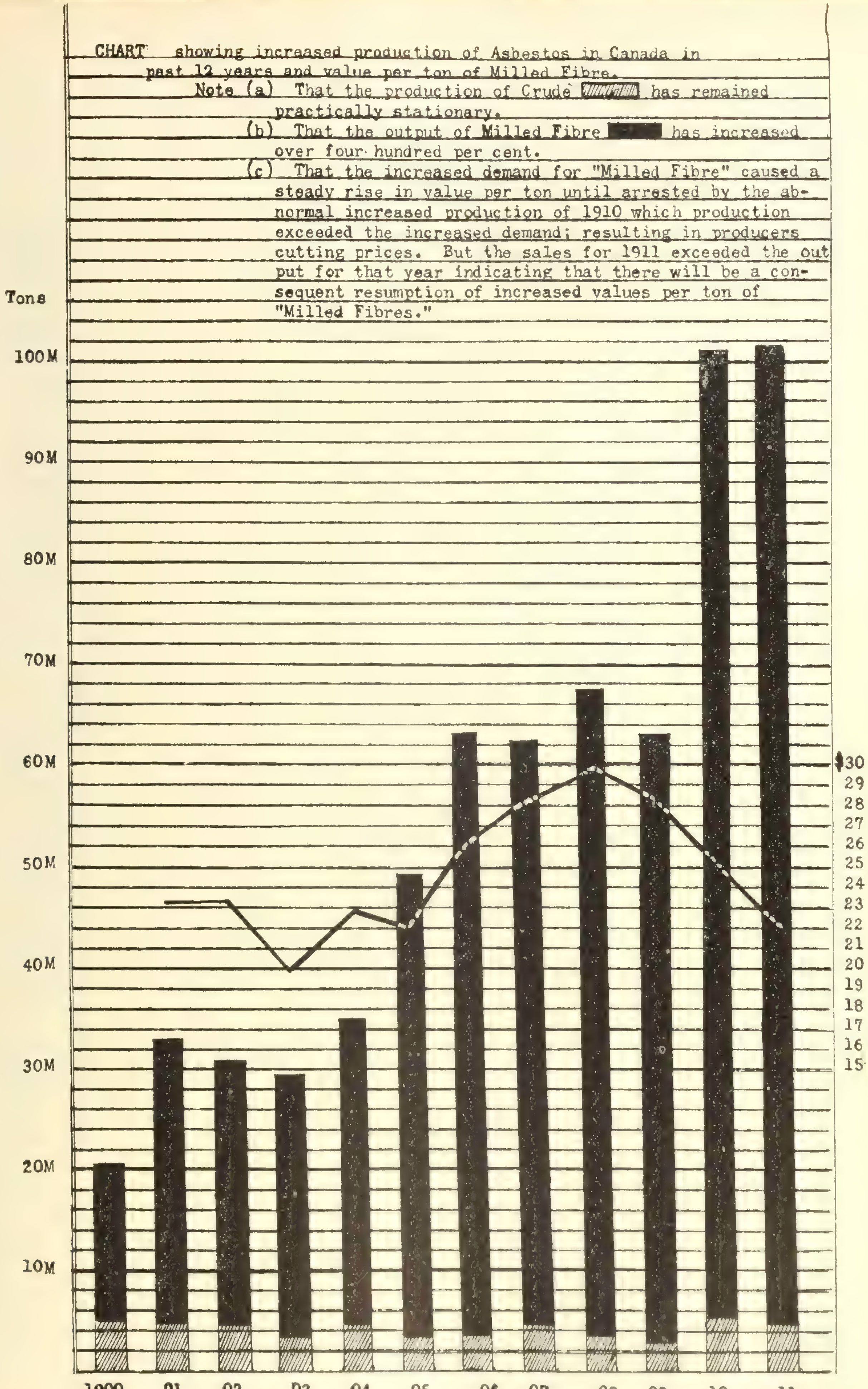
The B. & A. Asbestos Co. (Robertsville).

The mine is in full operation an demploys 125 men, and produces 50 tons of asbestos daily. The rock yields 8 per cent. asbestos, but as high as 10 per cent has been mined. The production of all the property in 1911 was 3,600 short tons, the average value of the output being $27 per ton. In addition to No. 2 Crude, four grades of fibre are produced, as follows:—

F1.—Spinning.

F2.—Paper stock.

F2X.—Slate and shingle stock must be very clean.



ASBESTOS OUTPUT

F3.—Short fibre used filler in mill board, etc. None of the lower grades under $5 per ton is saved.

Mills in the District.

The following table shows the number of mills and milling capacity at mines now in active operation:

Company.	No. of Mills Operating.	Men Employed.	Yearly. Capacity Tons.
Berlin Asbestos Co...	1	125	10,000
B. & A. Asbestos Co...	1	125	10,000
Bell Mines	1	420	20,000
Jacobs Asbestos Mining Co.	1	425	20,000
Amalgamated Asbestos Corporation ...	4	800	40.000
Johnson Asbestos Co.	2	300	10,000
Martin-Bennett.	1	220	25,000
Black Lake Consolidated.	1	230	10.000
Asbestos & Abestic Co., Danville	1		25.000
	13	2.645	170.000

Capacity given in tons of fibre produced per year based on daily capacity for yearly run of 200 days.

STATISTICS.

The shipments of asbestos from the various producing centres, Thetford Mines, Black Lake, Danville, East Broughton, all in the Eastern Townships, reached a total of 102,224 tons, valued at $3.026.306, the highest sales yet recorded. This is a substantial increase as compared with the previous year, 1910, when these shipments were 80.605 tons, valued at $2.667.829.

For the purpose of comparison, we give the details of last year's production as well as this year's.

Production of Asbestos for 1910.

	SHIPMENTS.			Stocks on hand on Dec. 31, 1910.	
	Tons.	Value.	Value per ton.	Tons.	Value.
Crude No. 1	1,817	$ 471.649	$250.57	1.763	$ 447.227
Crude No. 2	1,612	196.382	121.82	3.181	440.884
Mill Stock No. 1	10,313	627.635	60.88	4.938	313.053
Mill Stock No. 2	44,793	1.141.374	25.48	24.417	612.065
Mill Stock No. 3	22.070	230.789	10.46	6.920	99.694
Totals	80,605	$2.667.829	$ 33.10	41.159	$1.921.923

Quantity of rock mined during year 1910, tons 2,035.705.

Quantity of asbestos as stock on hand Dec. 31, 1909, tons 20.921.*

*Figures of the Federal Mines Branch.

Production of Asbestos for Year 1911.

	SHIPMENTS.			Stock on hand.	
	Tons.	Value.	Average value per ton.	Tons.	Values.
Crude No. 1	1,400	$ 388.224	$277.30	1.358	$ 360.304
Crude No. 2	3,382	382.980	113.68	3.368	431.548
Mill Stock No 1	6,340	415.559	65.54	3,794	207.403
Mill Stock No. 2	35,991	1.041.684	30.33	12.272	379.523
Mill Stock No. 3	55,111	747.759	13.57	12.959	204.298
Totals	102.224	$3.026.306	......	33.751	$1.583.076

Quantity of rock mined during year 1911, tons, 1,759.064.

The whole of the rock mined does not go to the mills. A proportion of about 25 per cent. is considered too poor to be treated economically, and is thrown on the waste dump.

ASBESTOS PRODUCTION OF THE WORLD.

(Exclusive of Canada.)

Unfortunately, statistics of asbestos production in countries other than Canada giving the returns for 1910 and 1911 are not obtainable. The following table, compiled from the report on colonial and foreign statistics of the Home Office, England, presents these returns for 1909, and is of general interest as indicating Canada's pre-eminence in this field:

	Metric Ton.	Value.
Russia.	11,911	£92,180
Cape Colony	1,519	24,922
United States	2.799	12,855
Cyprus.	156	1.407
Rhodesia.	247	2.725
Australia.	3	154
	16.635	£134.243

These quantities are equal to 18.342 short tons, valued at $653.761.

J. S. Diller, in the Mineral Resources of the United States, gives the production of that country during 1910, as 3,693 tons, valued at $68.357.

Rhodesia reports a production of 1,114½ tons valued at £12.904 for 1910.

Unofficial figures for Russia give a production of 15.540 metric tons of asbestos in 1911

The first report of the Mines Department of the Union of South Africa for seven months ending 31st December, 1910, mentions that asbestos mines have been worked and contributed to the mineral output in Transvaal, Cape Colony and Natal. It is from the Cape, that the principal production comes, 680 tons, valued at £10,598.

No recent statistics are available from Portuguese South Africa concerning asbestos, but a few years ago a substantial shipment of asbestos of high grade was effected.

THE PRESENT CONDITION OF THE ASBESTOS INDUSTRY IN CANADA

By H. Mortimer-Lamb.

As is generally known, over 80 per cent. of the world's consumption of asbestos is derived from the limited area comprising the five districts of Thetford, Black Lake, Broughton, Robertsonville and Danville, in the Eastern Townships of the Province of Quebec.

Asbestos was first discovered at des Plantes River in 1860. This occurrence, however, was not of economic importance, and the real birth-year of the industry was 1877, consequent upon the Thetford and Coleraine discoveries. The history of the industry falls naturally into five distinct stages or periods. The first, from 1877 to 1890, when "crude" (the long-fibre asbestos cobbed out of the rock) was almost exclusively produced. In this stage the output increased from 50 tons produced in 1877 to 9,860 tons in 1900. Towards the close of the period it became recognized that the cost of hand extraction of "crude" alone was excessive, and that unless a more economical method of extracting the lower grade or shorter fibres was devised, the industry would not succeed.

The next period, therefore, between 1890 and 1895, was one of experimentation in and evolution of milling methods for the economical extraction of short fibre. In the interim production decreased. At the close of 1895 a milling practice affording reasonably satisfactory results had been evolved.

The fourth period, from 1909 to the end of 1911, was marked by the exploitation of the industry by the company promoter.

The evolution of the industry is, however, more graphically indicated in the following table and diagrams:

	Crude			Mill Stock				
Year.	Tons.	Value.	Per Ton.	Tons.	Value.	Per Ton.	Total Tons.	Total Value.
1900	....	......	......	.....	....	$....	21,408	$719,416
1901	4,743	$612,434	$129.14	28,713	661,881	$23.00	33,456	1,274,315
1902	4,450	545,713	124,08	26,184	616,257	23.00	30,634	1,161,970
1903	3,284	345,766	105.29	25,977	571,204	21.98	29,261	916,970
1904	4,372	517,779	118.43	31,107	669,016	21.50	35,479	1,186,795
1905	3,598	465,110	129.26	45,362	1,001,340	22.29	48,960	1,476,450
1906	3,927	645,735	164.43	58,448	1,497,918	25.62	62,375	2,143,653
1907	4,425	829,761	187.51	57,560	1,626,158	28.73	61,985	2,455,919
1908	3,671	699,521	190.55	61,485	1,852,075	30.12	65,156	2,551,596
1909	3,074	575,510	187.55	60,275	1,709,077	28.35	63,349	2,284,587
1910	5,449	968,046	177.67	94,981	2,435,312	25.64	100,430	3,403,358*
1911	4,863	744,962	158.18	96,029	2,177,100	22.67	100,893	2,922,062†

*Output figures taken.
†Sales figures taken.

An analysis of the above figures shows that the production of the crude material has been maintained at a tolerably uniform rate of in the vicinity of 5,000 tons annually, during the period under review. On the other hand, there has been a notable and steady increase in the production of mill stock. Moreover, with two brief intermissions the price of mill-stock advanced until the maximum average price of approximately $30 a ton was reached in 1908, from which date the price as rapidly declined. The present average price of about $22.50 for mill-stock is in most cases below the actual cost of production. An explanation of these conditions is that there have been no further discoveries of crude, the really high-priced product, admitting of any considerable increased production of asbestos of this grade. In mill stock, prior to 1909, a healthy equilibrium was maintained between production and consumption. In 1909, however, as already mentioned, the promoter saw his opportunity. The result to the industry was disastrous. Heavily over-capitalized companies were launched and to justify the exaggerated estimates of earnings given to the public, a policy of gross over-production was adopted. This, as will be observed in the chart, resulted in an increased output in 1910 over 30,000 tons of fibre, as compared with the returns of the preceding year. Meanwhile prices had sharply declined, this decline being directly attributable to over-production and consequent price cutting. The column in the chart for 1911 represents the actual sales during that year, indicating that in spite of the tremendous increase in production the market absorbed the surplus production of 1910, though at a low price. According to the official returns published by the Quebec Government, stocks on hand at the close of 1911 were 33,751 tons, as compared with 41,159 tons in 1910. Thus the balance as between production and shipments is being

gradually readjusted, and the situation in general is much more promising than it has been for some time past. There are, however, certain disturbing factors of which count must be taken. The reorganization of the Amalgamated Asbestos and of the Black Lake Consolidated has just been effected. In the case of the former, the capital and fixed charges have been reduced. The bond issue is now three million dollars instead of five. Since the bonds bear interest at the rate of 5 per cent. the annual charge on this account is now $150,000. According to a statement contained in a circular issued to bondholders by the "General Bondholders Committee" early in the year, the Amalgamated Company's "plant is capable of an annual output of 30,000 tons" and profits are estimated at $8.00 per ton. Assuming these statements to be correct, although the estimated profit is certainly high, the Amalgamated Asbestos Company will still require to tax their production capacity to the utmost in order to make even a very modest return to holders of the preferred and common shares—in fact, at the best, the outlook for the ordinary shareholders is exceedingly dubious. The situation is the same as regards the Black Lake Consolidated. Both undertakings are saddled with an altogether unfair load; neither can afford to curtail production. But either production in the district must be curtailed to not exceed ordinary market requirements, or, at ruling prices, the costs of production will have to be materially reduced if the industry is to survive, much less flourish. As a matter of fact the operators are in a position to control the situation if they could mutually agree to maintain prices at a certain level; but, unfortunately, the likelihood of such an understanding being reached is remote to a degree. Consequently, if over-production and competitive methods envolving price-cutting continue to obtain without regard to economic considerations of supply and demand, it is inevitable that sooner or later the weaker mines will go to the wall; none will profit.

To sum up briefly: The demand for asbestos is not only greater than at any previous time, but this demand is increasing steadily. The supply, however, at the rate of production recently maintained, is considerably in excess of the demand. A fierce competition between producers to secure market preference, has, in consequence, ensued, with the result that prevailing prices for the bulk of the product, namely, mill-fibre, do not admit of a reasonable return on operations. The hopeful feature is that the causes responsible for the present unfavourable conditions are known and can be remedied. Sanely conducted the industry has an excellent future. If the past rate of increased consumption continues, as seems inevitable, the condition should shortly arrive when the mines instead of over-producing will be taxed to meet the demand.

THE TOPOGRAPHICAL DIVISION OF THE GEOLOGICAL SURVEY

By W. H. Boyd.*

Topography is the delineation of the natural and artificial features of a locality. Topographical surveying is the process of accurately determining the relative positions of the natural and artificial features of a locality and representing them on a map. The natural features (drainage and relief) are the lakes, rivers, streams, mountains, hills and undulations of the surface; while the artificial features (culture) are the works of man, such as the towns, railways, roads, trails, etc. The correct relative positions of these features are obtained by some method of survey; the results of these surveys establishes the mathematical base, or control points, of the map; the representation of these features is shown by an accurate sketch of these features between the control points. In other words, a topographical map is a sketch controlled by fixed points (locations). It is evident then that the work connected with the making of a topographical map consists of two parts, namely, that of fixing the locations, which is instrumental, and that of sketching, which is done by the hand and eye. Although the sketching is all that appears on the finished map, yet it is essential and most important to have a correct mathematical base to control the sketching, in order that the map may be a trustworthy one. Briefly stated, the correctness of a map depends on the following: the accuracy of the locations, the number of the locations per square inch of map surface, the distribution of the locations and the quality of the sketching.

The main principle observed in map-making is to work from the whole to the part. No compilation of independent groups of surveys or plans will ever result in a trustworthy map. Observing this principle then, it is first necessary to obtain a primary control of the area; by this are established a few locations of a high degree of accuracy, on which depend all other locations. Between these primary control points is then established the secondary control; by this many locations are made with a lesser degree of accuracy, but yet sufficiently accurate so that other points located from them will be well within the allowable error of location. The maximum allowable error in the location of a point is taken as being 1/100 of an inch of the map scale. Between the primary and secondary control is established the tertiary system of location which embraces all the points necessary for the proper sketching of the culture, drainage and relief over the area

The methods and instruments employed in fixing the locations vary with the scale of the map, the character of the country, and purposes for which the map is intended. These three factors must be known before undertaking a topographical survey of a country. The contour interval to be used on the map must also be known, as the accuracy with which the elevations on contour points are determined is based on the interval selected, which in turn is governed by the map scale and character of the country.

The following diagram shows all the methods adopted by the Topographical Division, as a standard for obtaining the mathematical control over any map area. This diagram embraces all the methods of mapping used by the division. The methods of mapping are those commonly known as the camera method, the

*This article was secured through the courtesy of the Director, Mr. R. W. Brock.

plane table intersection method, and the traverse method. The complete mapping of an area is not necessarily confined to one method, sometimes two, or all three, of the methods are combined. The combina-
all three of the methods are combined. The combina-
country which is being mapped.

Diagram of Control (Graded.)

Standard Topographical Maps.

Primary.	Horizontal.	1. Triangulation—directions—8 in. theodolite—2 secs. 2. Triangulation—repetition—6 in. transit theo—10 seconds. 3. Traverse—transit 20 or 30 seconds and tape.
	Vertical.	a. Levelling — reading to $\frac{1}{1000}$ foot. b. Zenith distances, reading to 30 seconds.
Secondary.	Horizontal.	4. Triangulation for camera stations—transit to 1 min. 5. Triangulation plane table and telescope alidade. 6. Traverse—transit and micrometer eye piece—transit —30 seconds or 1 minute. 7. Traverse—transit and stadia.
	Vertical.	c. Levelling—ordinary. d. Vertical angles to 1 minute.
Tertiary.	Horizontal.	8. Photograph intersections. 9. Plane table intersections. 10. Plane table and stadia or micrometer eye piece. 11. Compass and telemeter.
	Vertical.	e. Vertical angles to 1 minute. f. Hand levelling.
Filling In.	Horizontal.	12. Plane table, tape, wheel or pace. 13. Compass, tape, wheel or pace. 14. Compass, time or estimation.
	Vertical.	g. Aneroid barometer.

Sketching, Continuous Contours.

Sketching of land forms from photographs.
Sketching of land forms from plane table stations.
Sketching of land forms from traverse lines.

The Standard Topographical Maps are printed in three colours, black, blue and brown. The black is used for the culture, the blue for drainage, and the brown for the contours showing land forms and relief. Conventional signs are employed to facilitate the reading of the map. Each map has a legend showing all the signs that have been used over the whole map.

It is to be hoped that in this country the value of a good topographical map will be more widely recognized, since it is of great practical assistance to engineers and others who are engaged in the work of developing the natural resources of this country.

The topographical mapping done by the Geological Survey before and after the organization of the Topographical Division is given below, also the method the Survey has adopted of classifying all of their maps.

The Topographical Division of the Geological Survey was organized in 1909. The division is small at present, consisting of 1 topographer in charge, 3 junior topographers, a triangulator and computor, and 9 topographic assistants. Since the organization of the division 15 standard maps have been executed; of these 10 are regular sheets, that is, bounded by even degrees, half degrees or quarter degrees of latitude and longitude, depending on the scale $\frac{1}{250000}$, $\frac{1}{125000}$ and $\frac{1}{62500}$ respectively. The 15 sheets above mentioned cover a total land area of approximately 4,800 square miles and vary in scale from 400 ft. to 1 inch to $\frac{1}{250000}$ or approximately 4 miles to 1 inch, with contour intervals of 20, 100, and 200 ft.

The Geological Survey has altogether completed 53 topographical maps which cover a land area of approximately 60,239 square miles, the scale ranging from 400 ft. to 1 inch to 8 miles to 1 inch with contour intervals varying from 20 ft. to 1,000 ft. Thirty-nine of these maps were completed since 1905, covering a total land area of approximately 15,741 square miles.

Topographical Mapping Done by Geological Survey From 1905 to 1911.

Map District.	Scale.	Contour Interval.	Approx. Land Area in Sq. Miles.
1905.			
*Rossland	400 ft. to 1 in.	20	2
Elk River	2 miles to 1 in.	200	230
1906.			
*Rossland	1.200 ft. to 1 in.	40	7.5
Costigan Coal Basin (started).			
Telkwa River	2 miles to 1 in.	250	400
Conrad	2 miles to 1 in.	250	640
Princeton Coal Basin	½ mile to 1 in.	100	90
Bonanza and Hunker Creeks	½ mile to 1 in.	50	165
1907.			
Lardeau (completed)	4 miles to 1 in.	500	1400
Costigan Coal Basin (completed)	1 mile	100	450
Hedley	1000 ft. to 1 in.	100	16
Whitehorse	1 mile to 1 in.	50	112
1808.			
*Phoenix	400 ft. to 1 in.	20	2
Bathurst (started)			
Bulkley Valley (started).			
Bighorn	2 miles	200	340
Tulameen	1 mile	100	170
Braeburn-Kynocks	2 miles	250	390
Tantalus	2 miles	250	400
1909.			
Topographic Division Organized.			
Wheaton	1 mile	100	170
Bathurst (completed)	1 mile	20	310
Bulkley Valley (continued).			
Slocan (started).			
Beaverdell (started).			
*Saanich Sheet	1 mile	20	78
*Victoria Sheet	1 mile	20	52
Nipisiguit Iron Deposit	400 ft. to 1 in.	20	0.5
1910.			
*Deadwood	400 ft. to 1 in.	20	0.5
*Sooke Sheet	2 miles to 1 in.	200	230
*Duncan Sheet	2 miles to 1 in.	200	375
*Nanaimo Sheet	1 mile to 1 in.	20	140
*Orillia Sheet	1 mile to 1 in.	20	150
Atlin	2 miles to 1 in.	200	525
Jasper Park	1 mile to 1 in.	100	53
Tobique	2 miles to 1 in.	40	440
Bulkley Valley (completed)	4 miles to 1 in.	250	4800
Portland Canal	2 miles to 1 in.	200	80
1911.			
*Slocan (completed)	1 mile to 1 in.	100	270
*Cowichan Sheet	4 miles to 1 in.	200	1370
*Alberni Sheet	4 miles to 1 in.	200	1335
*Moncton	1 mile to 1 in.	20	230
*Frank Landslide	800 ft. to 1 in.	20	3.5
*Balsam Lake Sheet	1 mile to 1 in.	20	180
*Mud Lake Sheet	1 mile to 1 in.	20	200
*Blairmore (started)	1 mile to 1 inch	100	194 (64 completed)
Jasper Park (continued).			

Total. 39 maps. Total, 15,741 square miles.

Topographical Work by Geological Survey Previous to 1905

British Columbia.			
Caribou	2 miles to 1 in.	250	2180
Crow's Nest	2 miles to 1 in.	500	500
Boundary Mining District	1 mile to 1 in.	100	215
West Kootenay	4 miles to 1 in.	500	5920
Yellowhead Pass	8 miles to 1 in.	1000	1920
Atlin	4 miles to 1 in.	500	3580
Kamloops	4 miles to 1 in.	500	6400

*Rated as G. S. C. Standard maps.

Shuswap	4 miles to 1 in...	500	6400
Trail	1 mile to 1 in....	100	210
East Kootenay	4 miles to 1 in...	500	2900
Manitoba.			
Turtle Mountain	1½ miles to 1 in.	25	495
Northwest Manitoba	8 miles to 1 in...	100	12672
Yukon.			
Klondike	2 miles to 1 in...	100	1064
Ontario.			
Silver Mountain Mining District	4-inch=1 mile ..	25	42
Total			44,498

Total, 14 maps Grand total, 60,239 square miles.

Classification of Maps.

As the Geological Survey issues so many maps other than their standard class, it was considered advisable to classify them with relation to their degree of accuracy and to use a concrete expression on the map so that the general public would be made acquainted with the fact that a definite system of map classification was used by the Geological Survey, thereby guiding them, in a general way, in the usage of such maps. The following is the scheme adopted:

1. The mapping of the Geological Survey is divided into five classes, namely:

Class A.—Maps, topographical.
Class B.—Maps, geographical.
Class C.—Route maps.
Class D.—Plans.
Class E.—Diagrams.

Any of these may be used as a base for geology.

2. The word "topography" is applied in its true ense as the delineation of the natural and artificial features of a locality,—this class essentially shows "relief."

3. The word 'geography" is applied to a map the area of which has been surveyed or compiled from various data, but which does not show "relief."

The word "geography" is applied to a map the area of which is surveyed or compiled from various data and which shows "relief," but the representation of which is not of the character or quality demanded by the class which carries the name of "topography."

4. The word "plan" is applied to the representation, without showing "relief," of an area given on plan scale; the expression "plan scale" is considered to embrace scales of say, 1,200 feet to an inch, and larger; a plan would necessarily require plan accuracy, otherwise it would fall into the "diagram" class. In the title of a plan, the wording "plan of" would be included.

5. The word "diagram" is applied in its true meaning to drawings, coloured or uncoloured, which have been prepared to illustrate statements, or to facilitate, in a general way, the broad understanding of a subject; under no consideration will the accuracy of the material from which a diagram is prepared, influence the raising of such an illustration into the map or plan classification.

6. The grading or classification is only used in the treatment of topographical or geographical maps, and not with plans or diagrams.

7. The standard in topography or geography is that of the Geological Survey; this standard, it is believed, will compare favourably with that of other countries.

8. In the classification of maps, whether topographical or geographical, there are three distinct groupings, namely:

Group 1. Standard maps.
Group 2. Graded maps.
Group 3. Inferior maps.

In the case of "standard" maps, no statement as to their accuracy would be given to the general public, they standing on their own merits according to the branch of mapping which they represent being accurate to scale throughout; "standard" maps, therefore, would be of a somewhat limited number at the present time.

By accepting this basis of standardization, it follows that the large proportion of maps would fall into the "graded" group, which affords scope for the classification of maps not attaining the "standard" group, nor descending into the "inferior."

The "inferior" group would comprise maps of very little topographical or geographical value, but useful as guides or illustrations.

9. Wording of classification to be printed on graded maps (group 2).

Class A.	Class B.
Topography rated grade 2.	Geography rated grade 2.
Topography rated grade 3.	Geography rated grade 3.
Topography rated grade 4.	Geography rated grade 4.

Class C. Route maps, rated grade 1. Rated grade 11. In the case of Class A. the word "detail" may be used as an adjunct to qualify topography.

Example:

Detail Topography
rated grade 2.

10. Wording of classification to be printed on maps of the inferior group (group 3).

Class A.	Class B.
Topography, inferior.	Geography, inferior.

11. Wording of classification to be printed on graded maps when they form the base for geology, forestry, etc.

Class A.	Class B.
Topographical base, rated grade 2.	Geographical base, rated grade 2.
Topographical base, rated grade 3.	Geographical base, rated grade 3.
Topographical base, rated grade 4.	Geographical base, rated grade 4.

12. Wording of classification to be printed on maps of the inferior group, when they form the base for geological colouring.

Class A.	Class B.
Topographical base, inferior.	Geographical base, inferior.

13. The above-mentioned decisions in no way supersede the present practice of qualifying, in detail, any part or portions of the methods relating to topographical or geographical mapping, which, when necessary to do so, is stated in the "information note" on the printed map.

THE COPPER DEPOSITS OF EASTERN QUEBEC

By John E. Hardman, S.B., M.A.C.

Half a century ago, or to speak precisely, between the years 1859 and 1865, there existed in that portion of Quebec Province which is known as the Eastern Townships, a very respectable and profitable copper mining industry. The capital invested was almost entirely American and came chiefly from the New England States. To-day there are but two properties working in this section which are mining copper, and both of these are owned and controlled by United States capital. The balance of the district is non-productive and idle. It is hoped that the present article may make known a number of facts which will show some reasons for this decline of an industry once so promising, and may indicate that, with modern methods and appliances, a profitable industry can now be inaugurated and maintained successfully.

At the time when copper ore began to be worked and marketed commercially in 1858 the entire production of metallic copper in the United States was about 4,000 tons, and the very high prices which obtained for metallic copper during the American Civil War continued until the highest figure (59¾c) was reached in July, 1864. During the next twelve months, or in June, 1865, this price fell to 29½c, a drop of 30c in twelve months. It must also be remembered that during the decade from 1858 to 1868 the Lake Superior mines first began their commercial production, the Franklin and Pewabic each reaching an output of a million and a half pounds of metallic copper between 1863 and 1865. In consequence of the discovery of the Lake Superior mines, and also by reason of the extreme drop in prices, the American capital interested in the Eastern Townships found a more profitable field in the newly discovered deposits of the Keweenaw Peninsula in Michigan and capital was withdrawn from the Quebec field.

The occurrence of copper in this portion of Quebec, at Brompton Lake, was noted as early as 1841 by Sir William Logan, but before any authoritative printed account was available active mining had begun, and the year 1858 saw the first shipments of sorted ore sent to Swansea. During this year (1858) and those immediately following several Cornish mine captains came out to Canada for the purpose of exploiting these deposits and the names of Captain William Bennett and Captain John Wearne are still remembered in many of the localities where copper ore was formerly mined.

The geology of this section of Quebec has been particularly described in papers by Mr. John A. Dresser, originally communicated to the "Journal of the Canadian Mining Institute" and also published in Volume I of "Economic Geology," 1906. Briefly described the rocks of this eastern portion of Quebec are pre-Cambrian in age and are composed of altered sediments, tuffs and true igneous rocks, the latter being porphyries, andesites and diabases. These rocks have been folded, squeezed, and contorted, forming ridges or anticlines whose general direction is north-east and south-west. In consequence of this folding "lines of least resistance" occur which have afforded passage ways, or channels, for mineral bearing solutions which, by deposition or through replacements, have impregnated the rocks with metallic sulphides of copper and iron, thus forming deposits which vary in thickness from the fraction of an inch to masses occasionally reaching 60 ft. in width. This mineralization of the crystalline rocks appears to have been confined to three ridges or belts running in a north-easterly direction. The first and most westerly of these begins near the south-western corner of Brome County and runs north-easterly through Arthabaska County; the second ridge commences at Lake Memphramagog and runs north-easterly through the City of Sherbrooke up to and beyond Lake St. Francis, this is the most important of the ridges; the third ridge extends along the international boundary between Maine and Quebec, but has only been prospected in a small section near the southern end of Lake Megantic.

These depositions or segregations of metallic mineral usually take the form of elongated ellipses or lenses which sometimes are connected together by a thin stringer of ore, but oftener are entirely disconnected. These lenses are arranged en echelon, and in one of the deepest shafts in the Province, that of the Eustis mine, these lenses have followed one another, and are still existing, to a total depth on the incline of the shaft of 3,300 ft.; in the Albert mine of the Nichols' Chemical Company the total depth reached by the incline shaft is between 3,600 and 3,700 ft.

The ores found are divided by their metallurgical characteristics into three distinct groups:

(1) Acid, or siliceous, ores occurring in acid rocks, sometimes with a quartzose gangue.

(2) Basic ores of which the base is chiefly iron, occurring usually in contact deposits having diabase for one wall, and typified best by the Memphramagog mine near Knowlton's Landing.

(3) Basic ores of which the base is chiefly lime, and typified by the Acton, Upton, and Ascot mines

The principal ore bodies hitherto worked have been those belonging to the first class and found in the Porphyry-Andesite Schists, the oldest rocks of the region. Ores of the second class are not so common, but usually occur in large bodies; the base ores of the third class are quite infrequent. Secondary copper minerals such as bornite and chalcocite occur sparingly and the evidence of secondary action is fragmentary and quite insufficient to permit of generalization. The evidence afforded by the older mines which have been worked continuously is to the effect that the ores continue to considerable depth with undiminished values in copper, silver, and gold.

The townships adjacent to and surrounding the city of Sherbrooke contain 50 or more properties which either have produced a respectable tonnage, or have shown bodies of ore which have been prospected in part, but have not yet been developed. The best known of the mines in this class are the Capelton, Eustis, King, Howard, Suffield, Huntingdon, Clarke, etc. Farthest to the north-east is the old Harvey Hill mine, and in the south-west is the once famous Huntingdon mine which has been worked to a depth of about 700 ft.

The values contained in these three different classes of ore do not vary greatly, probably the highest copper values are in the lime-basis ores and the higher silver values with the acid ores. The general average composition obtained from a very large number of samplings gives, for the acid ore, about 60% uncombined silica with from 20 to 25% alumina and iron, and 10% sulphur; the copper averaging 3%. The iron basic ores carry from 45 to 48% metallic iron and from 2½ to 7% of copper. In Mr. Presser's article on this subject (previously referred to in this article) he gives the average of the Capelton Hill as from 4 to 5% in copper, 38 to 40% in sulphur, for the properties on the southern slope of the hill; for the properties on the northern side of the hill he gives a smaller average in sulphur and about the same percentage in copper.

Taking into review the general average of all the copper deposits in the townships, and averaging all classes of ore, the percentage of copper may be taken at not less than 3% and the precious metal (silver and gold) contents at from two to three dollars; the average percentage of sulphur lies between 25 and 30%, of silica between 40 and 45%, and of iron from 15 to 20%. To the metallurgist this average analysis indicate a composition that is readily fusible in the furnace.

During the period of activity in the early '60's several small furnaces and smelting works were built of which only fragments and ruins now exist. All values in these ores, other than sulphur, have been religiously concealed by the companies which have been in existence for over 30 years, and the general public knows of these mines only as containing ores of sulphur and having value only for sulphuric acid making. Undoubtedly this view has been helped largely by the fact that the cinder, after the sulphur has been burned off, has been shipped out of the country to the United States and there smelted, the copper and silver contents being credited to the production of the United Sates and not to the Province of Quebec.

It must also be noted that during the 40 years which have elapsed since the cessation of active work in the townships much railroad building has been done there, and the facilities for shipping ore have been very much increased. Sherbrooke is an important railroad centre having four different lines of railways entering the town, yet renewed interest in the copper resources of the district is still lacking. Investigation has shown that, with the exception of one or two particularly rich deposits, such as the recent discovery at Weedon, the mining of ore to ship and sell abroad is not profitable, and that the hope of a new industry in these ores is dependent upon the advent of smelting facilities which shall be able to treat the ore within a reasonable distance of the mine. The ores offer, if carefully selected an almost ideal assortment for smelting without the use of barren fluxes. In addition to transportation facilities labour in the townships is cheaper than almost anywhere else in Canada and a large supply of electric power is available for all requirements of mining and smelting.

If the reader will take into consideration a few facts it should seem evident that there is the basis here for a permanent industry; the annual importations of copper into the Dominion are about 28,000,000 lbs, all the crude copper shipped from the large mines in British Columbia and those near Sudbury, Ontario, is sent to the United States to be refined, no refined copper is made in Canada. As to the importations, whether in bars, billets, rods, tubes, sheets, or any other form, 90% comes from the United States and 10% from Great Britain. These facts point to the desirability of the Dominion refining its own production of copper, which in crude form totals nearly 100,000,000 lbs. a year.

The small venturer in copper mining will not be successful, and it is admitted at once that a large capital is required to make the deposits of Eastern Quebec profitable. The deposits are large enough and extensive enough to justify the investment of large capital and such investment would have a long period of life and a satisfactory profit. Probably the reason why these fields have so long lain dormant is that they are practically at the doorstep of Montreal and too near to enjoy the benefit of that old Cornish saying which declares that "Far away fields look green."

THE EUSTIS MINE, EUSTIS, QUE.

By J. M. Passow, A.R.S.M.*.

The ore bodies of the Eustis Mining Company's mine consist of four well defined lenses. They dip in a southeasterly directions, are parallel to each other, and slightly overlap. The sectional dimensions are approximately as follows: Footwall vein, 50,100 feet long by 4-20 feet thick; main vein, 100-120 feet long by 20-60 feet thick; shaft vein, 50-100 feet long by 3-15 feet thick; No. 1 vein 20-120 feet long by 2-25 feet thick. The footwall vein and shaft vein are richest in copper, averaging from 4 to 8%, while the main and No. 1 vein are richest in sulphur running 42 to 48% S., and 2½% to 4% Cu.

The country rock is a talcy schist, and in places the veins are crossed by diorite dykes which, however, have no effect on the vein; that is the vein remains the same on each side of the dyke. Development working consists chiefly of sinking the shaft in ore and drifting each way along the strike to the end of the ore body, and also cross-cutting the foot and hanging directly under and over these known lenses and about 200,000 tons of good ore is proved up. The shaft is sunk in the smallest vein, and levels are carried off from the shaft to the main vein, and from this crosscuts are driven to the footwall and then a drift is run along the footwall and from this an over stope is started. Often a raise has been made to the next level for air and the miners work upwards standing on the ore they break. The shaft is kept clean by means of a

*Assistant Supt. the Eustis Mining Co.

separate hoist handling a one-ton self-dumping skip, operated by a 20 h.p. motor, and discharging into a bin which loads directly into one of the main hoisting skips by means of a gate worked by a handwheel, rack and pinion. Canadian Rand 3⅛″ piston drills, Holman 3″ piston, Canadian Rand "Butterfly valve" hammer drills, Sullivan hammer drills and Little Hardy self-rotating hammer drills are employed. Air is supplied

Nichols Chemical Co.'s Plant

by a ten-drill electrically driven compressor, a steam driven compressor is held in reserve.

The main shaft is about 3450 feet deep. The ore is taken from an adit level 1,000 feet long which connects with the shaft at 550 feet below the summit of the hill. The double drum hoist operated by 150 h.p. motor, (another 150 h.p. being held in reserve) hoists three-ton self-dumping skips at a speed of about 500 feet per minute up the shaft, which has an average inclination of about 38 degrees; from the skips the ore goes into a loading bin, and thence is loaded into the three 1-ton side discharge cars, constituting the train which is drawn by a 30 h.p. electric locomotive. At some distance after leaving the tunnel the train is dropped down a steep incline by means of a balance weight, rope and drum with a suitable brake. The balance weight, consisting of cars loaded with ore and scrap iron, weighs rather more than the locomotive and empty train, but not as much as the locomotive and loaded train, thus the loaded train draws the counter weight up the incline, while in turn the balance weight performs the same service for the empty train. The maximum capacity of the mine equipment is equal to about 150 tons per shift.

After reaching the mill the ore is dumped from the cars into a grizzly with bars set 2¾″ apart. The oversize goes to the dressing floor where the first class is passed though a 20 by 6 inch and 16 by 10 inch Farrel-Bacon crushers, is then elevated and discharged on to a grizzly with bars set one inch apart and having a ⅜-inch screen beneath, and thence to a trommel having 2⅜-inch holes and an outside fine screen, over half of its length being ⅜-inch square holes. It is then conveyed to bins and transferred from these for shipment to lines on the siding of the Boston & Maine Railway.

The second class ore goes into a 24 by 15 inch Farrel-Bacon crusher and thence by means of a bucket elevator to a trommel having 1¼-inch holes. The undersize passes to a large bin from which it is fed automatically to a set of rolls 30 in. by 20 in. This product is conveyed by a bucket elevator to two trommels covered with 5 by 5 mesh wire; the undersize goes to a Richards classifier and thence to eight Wilfiy tables. The oversize goes to two sets of 20 x 8 inch rolls and back to the aforesaid elevator; the oversize from this screen goes to an 11 by 15 Dodge crusher and into the same elevator as the discharge from the 24 by 15 inch crusher. The rock is dumped by car outside the mill. The concentrating plant has a capacity of about ten tons of mill feed per hour, and the dump plant about fifteen tons per hour.

The B. & M. side track will hold thirteen railroad cars above the bins. The loading bins will hold about 800 tons of lump and 100 tons of fines. Any excess above weekly shipments is dumped on stock piles below the mill, as are all the wet concentrates in order to dry them. There are four tunnels beneath the stock piles, and in the tunnels under the fines is a belt conveyer which loads directly into the cars in the tunnel. Under the lump pile an electrically operated self-pump skip is loaded through the holes in the roof of the tunnel and dumped into one of the loading bins. A 30-ton car has been loaded in eight minutes with the belt conveyer.

The machinery in general is operated by electricity, generated at the Eustis Mining Company's plant on the Coaticook River about two miles distant. The power house contains one 250 and one 150 k.w. machine. The available head is 32 feet, and the current is 3 phase, 25 cycle, 2200 volt.

THIS SUMMER'S FIELD WORK OF THE GEOLOGICAL SURVEY—GEOLOGICAL DIVISION

Field Parties for 1912.

Cairnes, D.D.—Completion of the geological section along the Alaska-Yukon boundary between the Porcupine and Yukon rivers. Preparation of the guide book of the Yukon excursion (I.G.C.) between Prince Rupert and Dawson.

Malloch, G.—Explorations in the Ground Hog coal basin and elsewhere along the head waters of the Skeena River. Examination of reported coal area on Sustut Creek and two coal basins just north of Hazelton.

McConnell, R. G.—Detailed investigation of the magnetite and gold-copper deposits of Texada Island. Explorations in Rainy Hollow and vicinity. Preparation of guide book of Prince Rupert-Aldermere excursion (I.G.C.) along the Grand Trunk Pacific.

Clapp, C. H.—Completion of the geological mapping of the Sooke and Duncan sheets. Preparation of the guide book of the Vancouver Island excursion on (I.G.C.). Detailed examination of mineralized belt on East Sooke Peninsula.

Bowen, N. L.—Mapping geological section on Canaan Pacific Railway between Lytton and Vancouver.

Bateman, A. M.—Explorations is gold-bearing areas tween Bridge River and Chilco Lake.

Drysdale, C. W.—Mapping geological section on nadian Pacific Railway between Six-Mile Point and tton.

Rose, B.—Petrographical and structural investigans of the tertiary rocks exposed between Savonas d Six-Mile Point.

Daly, R. A.—Mapping geological section along Canaan Pacific Railway between Revelstoke and Golden. pervisions of Allan, Drysdale and Rose.

Allan, J. A.—Mapping geological section along Canaan Pacific Railway between Golden and Banff. mpletion of the southwest corner of Ice River sheet.

Walcott, C. D.—Palaeontological investigations in e Yellowhead Pass.

Camsell, C.—Examination of mineralized areas on uger, Copper and Apex Mountains and at White ke, Similkameen Mining Division. Preparation of ide book for excursion (I.G.C.) between Midway and ence's Bridge. Supervision of Bateman and Bowen.

LeRoy, O. E.—General supervision in connection ith excursions of the International Geological Conress. Preparation of guide books for West Kootenay, oundary and Vancouver excursions (I.G.C.).

Schofield, S. J.—Geological mapping of the south rtion of East Kootenay between Canadian Pacific ailway and International Boundary. Preparation of ide book for excursion (I.G.C.) between Elko and ootenay Landing.

Leach, W.—Geological mapping of the Blairmore ea. Preparation of the guide book for excursion .G.C.) between Burmis and Elko.

MacKenzie, J. D.—Explorations in the coal fields of uthwestern Alberta between the Blairmore-Frank ea and the International Boundary.

Dowling, D. B.—Preparation of guide books for exrsions (I.G.C.) on the plains and in portions of the ocky Mountains between the Grand Trunk Pacific d the Crow's Nest Branch of the C.P.R. Examinaon of the Flathead coal area. Supervision of Malloch d Mackenzie.

Moore, E. S. (assisted by R. A. Wallace).—Exploraons east of Lake Winnipeg in the Hole River District d adjoining areas.

McLean, A.—Preparation of the guide book for xcursion (I.G.C.) between Winnipeg and Rosebud via askatoon.

Trueman, J. D.—Revision of the geology of the Seine iver sheet. Preparation of the guide book for excuron (I.G.C.) between Port Arthur and Winnipeg along e Canadian Northern Railway.

Collins, W. H. (assisted by J. J. O'Neill).—Compleon of geological mapping of sheet No. 139 north of udbury. Preparation of guide book for excursion I.G.C.) between Nipigon and Winnipeg along the Naonal Transatlantic Railway.

Johnston, W. A.—Completion of geological mapping f the Beaverton, Sutton and Barrie sheets, Simcoe istrict. Preparation of guide book for Orillia excurion (I.G.C.).

Williams, M. Y.—Geological mapping of east portion f Manitoulin Island, including the Townships Tehkuah, Assignack and Sheguiandah and the unsurveyed erritory to the east.

Foerste, Aug.—Continuation of investigations in rdovician of Manitoulin Island.

Taylor, F. B.—Continuation of investigations on the Pleistocene in Western Ontario.

Stauffer, C. R.—Examination of Upper Monroe formation to complete studies on the Devonian in Southwestern Ontario. Preparation of guide maps for the Geological Congress in vicinity of Waterford and Port Colborne.

Wilson, M. E.—Exploration of area between Lake Kipawa and the junction of the Bell River and Nat. Trans. Railway, via Grand Lake Victoria.

Cooke, H. C.—Exploration of area between Middle Gull and Evans Lake and eastwards along Mill, Victoria and Nipukatasi rivers. Examination of reported occurrences of gold on Kiemawisk Lake.

Keele, J.—Investigation of the clay deposits of the Province of Quebec.

Harvie, R.—Completion of the geological mapping of the Orford sheet. Mapping geological section between Knowlton Landing and Cowansville. Preparation of guide book for the Asbestos excursion (I.G.C.).

Stansfield, J.—Preparation of guide maps for the Geological Congress in the vicinity of Guelph, Hamilton, Streetsville and Forks of Credit, Province of Ontario. Geological mapping of Mount Royal and vicinity. Preparation of guide book for A-8 excursion (I.G.C.). "The Mineral Deposits of the Ottawa District."

Goldthwait, J. W.—Continuation of work on marine shore lines in the Province of Quebec. Re-examination of beaches between Quebec and the Adirondacks.

Young, G. A.—Preparation of the guide book for the Quebec-Maritime Province excursion (I.G.C.). Supervision of Bell, Wright and Harvie.

Bell, W. A.—Continuation of work on the carboniferous section at Joggings. Palaeontological investigation in the vicinity of Windsor.

Wright, W. J.—Continuation of the investigation of the granites of Nova Scotia, with special reference to their economic importance.

Faribault, E. R.—Continuation of the geological mapping of the gold area of Nova Scotia. Completion of sheets 93, 94, 95 and 98. Examination of scheelite deposit at Scheelite and the prospects in the vicinity of New Ross. Supervision of Wright.

Raymond, P. E.—Palaeontological investigations at Quebec, in the Maritime Provinces and between Collingwood and Kingston in Ontario. Preparation of the guide book for A-11 excursion (I.G.C.). "The Ordovician at Montreal and Ottawa."

Hyde, J. E.—Palaeontological investigations in New Brunswick and Nova Scotia.

THE QUEBEC IRON INDUSTRY.

The immediate prospects of the iron industry in Quebec are not especially bright. The bog ore deposits of St. Maurice and of Drummond County appear to be approaching exhaustion, and while other iron ore occurrences, including the magnetic sands on the north shore of the St. Lawrence are known, their utilization for some time to come is not probable. Prof. Dulieux's final report on the titaniferous ores and the magnetic sands in the localities he is investigating is meanwhile looked for with interest, as heretofore, no comprehensive official pronouncement concerning the economic value of these occurrences has been made and current reports are decidedly conflicting. It may be mentioned as a fact not generally known that Prof. Lewes, of Newcastle.

England, was retained some few years ago to examine and report on the St. Lawrence sands for an English syndicate. It was commonly supposed that while the deposit was extensive, the question of its utilization was dependent on the devision of a cheap and adequate method of concentrating and vriquetting the sands. Prof. Lewes, however, informed the writer that the matter of treatment presented no obstacle, but that the deposit itself was too shallow for profitable working.

In 1911, the only furnace in blast was that of the Canada Iron Furnace Co. at Drummondville. The production of pig-iron was 655 tons, valued at $17,280, while only 931 tons of local iron ore was produced during the year.

A minor but profitable industry is the manufacture of ferro-phosphorus, conducted by the Electric Reduction Company, at Buckingham. The output last year was 25 tons. For some years other ferro compounds, such as ferro-silicon and ferro-chromium were also manufactured; but at present the effort of the company is directed almost exclusively to the manufacture of phosphorous.

THE SUFFIELD COPPER MINE, ASCOT TOWNSHIP, QUE.

The Suffield mine is situated about seven miles southwest of the City of Sherbrooke, in the Township of Ascot. The property, comprising 600 acres, is owned and the mine operated by Mr. A. L. Norton. Copper was first discovered on this property about 60 years ago, much prospecting was done without, however, disclosing any valuable body of ore, and the work was discontinued. Some 30 years later a new discovery was made and for a number of years active mining development was in progress, but after a quantity of low grade ore had been mined, work was again discontinued until 1906, when the property was acquired by Mr. Norton. Under his direction development operations were resumed and necessary machinery provided, including a 100 h.p. boiler, a 50 h.p. hoisting engine and a 5-drill Ingersoll-Sergent compressor. A shaft was sunk to a depth of 320 feet on an incline of 35 degrees, following the foot-wall of the ore body; drifts of 200 feet, 300 feet and 250 feet were driven on the first, second and third levels, respectively, and upraises were made at intervals of 100 feet, connecting the different levels. Development is still proceeding on the third level. All the mining has been in ore, and, to indicate the size of the ore-body, it may be stated that a crosscut passing through 40 feet of ore failed to reach the hanging wall. About 5,000 tons of ore have been hoisted, but up to date no ore has been shipped.

The ore occurs as desiminated pyrite and chalcopyrite in a highly silicious, serpentinized schist. The copper content varies from $2\frac{1}{4}$ to 5%, and occasionally as high as 9%. The sulphur averages about 30% per cent. The ore also carries small quantities of gold and silver. Concentration would evidently be necessary before the ore could be marketed to advantage.

The tracks of both the Boston and Maine and the Canadian Pacific Railways pass within two miles of the mine.

THE NATURAL RESOURCES DEPARTMENT OF THE C.P.R.

By L. O. Armstrong.

The Canadian Pacific has recently organized a very important department, namely, that of Natural Resources, under the direction of Mr. J. S. Dennis. For eastern lines the writer is Industrial and Colonization Agent, and has charge of the development of the mineral and other natural resources. When new discoveries and prospects are brought to his notice he makes a personal investigation, and, if favourably impressed, engages the services of a competent engineer to report.

At present the possible utilization of deposits of silica sand for glass-making and for the higher class cement products is attracting attention. No window glass is made in Canada and there is a very large importation of bottles, notwithstanding the fact that Canada has very large deposits of glass sand suitable for the manufacture of glass of the best quality. The development of copper areas in the eastern division is also being considered.

According to the department's records, the natural resources in Quebec now include alluvial gold deposits with accasional gold veins now being worked in the County of Megantic, on the Chaudiere River, which has a 500 h.p. watefall available. Springhill, Quebec, reports gold; Scotstown, copper and gold, with a good opening for an economic plant. At Eastman, asbestos is found, also copper and iron.

The Quebec Central Railroad runs through one of the best mineralized portions of the Province of Quebec. Copper, asbestos, chrome ore, iron ore, limestones and other economic minerals found here, make it a very attractive field. The rail and water connections are good, either from Quebec, Montreal, Portland, Boston, or New York. On the north shore of the St. Lawrence, east and west of Quebec, and in Eastern Ontario, are some of the largest titaniferous iron ore deposits in the world. The Province of Quebec has large and rich deposits of ore to supply the world for many centuries at the present rate of consumption. There are rich clays and limestones along the north shore of the St. Lawrence, between Quebec and Montreal. The oldest iron furnaces in Canada are at Radnor Forges, near Three Rivers.

The water power development is already very large, and there is more power to develop on the St. Maurice River. The development of the iron industry has barely begun.

There is natural gas on the north shore of the valley of the St. Lawrence. In the Laurentian Mountains between Quebec and Ottawa, is a vast, almost untouched territory. The few prospectors that have worked there have found magnesite, gaphite and rich titaniferous iron ore ilmanite. Large bodies of these minerals are well situated as to railway facilities, and there is water power to be had almost everywhere.

Graphite, magnesite, and mica are found between Labelle, north of Montreal, Grenville and Ottawa. There are extensive and rich bodies of natural phosphate (apatite) in this section of the country. The phosphate and graphite are now being worked profit-

bly. Half a million horse power could be developed f necessary at several points in this district by concen-ration.

At East Templeton there is a body of feldspar of ood quality. On the Gatineau River, north of Ottawa, re mica, phosphate, gold, marble, graphite and dolo-nite. There are splendid water powers in the Ottawa Valley from Ottawa to Waltham, and along the Cana-lian Pacific Railway from Ottawa to Port Arthur and Fort William, Ontario.

STRUCTURAL AND NON-METALLIC PRODUCTS IN QUEBEC.

Marble.—Reference has been made elsewhere in this ssue to the development of the marble resources of the Province. It may be added, however, that in addition o the two important enterprises particularized, a new undertaking has recently been inaugurated at Portage lu Fort, under the name of the Pontiac Marble Stone Co. Here a quarry is being opened and sawing and lressing machinery provided with a view to the early marketing of the product.

Koalin.—Another new undertaking is that of the St. James Construction Company under whose auspices the Kaolin deposits of Amherst Township are now being worked. There is an excellent market for Kaolin, which is used in the manufacture of both pottery and paper.

Cement.—The manufacture of cement in the province is an important and growing industry, the production in 1911 being 1,588,283 barrels (350 lbs. capacity) valued at $1,931,783. Production is controlled by the Canada Cement Company, whose Quebec works are at Hull, Longue Pointe and Pointe-aux-Trembles.

Glass Sand.—A small quantity of glass sand from West Shefford was tested last year by glass manufac-turers in Montreal. The results, however, are stated to have been unsatisfactory.

Sandstone.—The only sandstone quarried last year was in a locality of Gingues Township, on the shore of Lake Temiskaming. The stone, which dresses easily and has a pleasing buff colour, is quarried from a vein of the Niagara formation, resting directly on the pre-Cambrian and outcropping from Piché Point on Lake Temiskaming, for a distance of about three miles north-ward.

Feldspar.—Production in 1911 was limited to a few tons mined from a deposit on Manicouagan Bay, near Washeesho River, opposite the Island of Anticosti, and consigned for trial purposes to potteries at Trenton, New Jersey, and in England.

CHROMITE IN QUEBEC.

It is regrettable that past attempts to utilize the chrome iron deposits of the Eastern Townships have not been successful. Chromite occurs in large quanti-ties in the Serpentine belt between Disraeli and Broughton, but mining has been confined to the Coler-aine-Black Lake district. The ore here is of excellent quality, much of it being readily marketable without concentration, that is to say, containing over 40 per cent. chromium sesquioxide. There can be no doubt that the deposits could be profitably mined under skilled direction and some of the mines are, it is understood, to be re-opened this year.

In 1911 small shipments were made from stock-piles to local consumers requiring refractory material for furnace lining, while a sample lot was consigned to a manufacturer of ferro-chrome at Niagara Falls.

THE WEEDON (McDONALD) MINE, WEEDON, QUEBEC

East Canada Smelting Co.

The following information concerning the McDonald mine was obtained by a representative of the "Canadian Mining Journal" from Mr. Leland D. Adams, manager of the mine for the East Canada Smelting Company. The operating company, by the way, is an American corpora-tion with headquarters at 17 Battery Place, New York City. For many years the district, of which Weedon has become the centre, was known to contain copper-bearing measures. It remained, however, for the United States investor to take the initiative in developing this promis-ing region.

Property.

The property owned by the East Canada Smelting Company is now known as the Weedon mine. Formerly it went under the name of the McDonald mine. The company's holding comprise lots 22 A, B, C, and D, range 2; and lots 22 A, and B, range 3, in Weedon Township, Wolfe County, Province of Quebec. The total area is 375 acres of which 150 acres have been cleared for farming purposes. The remainder is thinly wooded, but it will yield enough timber for mining purposes for a number of years to come. The mine is about 200 feet above the town of Weedon, a station on the Quebec Central Railway, and about four miles distant.

History.

The property is mentioned casually in the early geolo-gical reports of the Quebec Government. The large area of gossan at one time attracted much attention, and re-sulted in the sinking of many shallow pits, none of which was on the ore body. In 1909 a shaft was sunk to a depth of 20 feet. The bottom of this shaft showed a solid body of pyrite and chalcopyrite. It was on this showing that the East Canada Smelting Company purchased the pro-perty. After assuming ownership, a year was spent in developing and diamond drilling. In August, 1910, the first shipments of ore were made. These were sent to the chemical plant at Capelton, P. Q., where the Nichols Chemical Co. operates a sulphuric acid plant. All ship-ments in 1910 and 1911 averaged 5% copper and 42% sulphur. In January, 1912, the tonnage was brought up to 150 tons per day, and the development ratio set at one ton extracted to three developed.

Geology.

On a low ridge forming the eastern limits of the St. Francis valley is the site of the property. The apex of the ridge is an acid granite, and the flank is a schist of pre-Cambrian age. This schist lies on a rock having much the appearance of a fine grained diabase, which is locally designated "trap." The ore is found with the

contact of schist and diabase, and the mineralization decreases as distance is gained from the diabase. Disseminated pyrite and chalcopyrite are found three and four hundred feet from the contact. The contact between the granite and schist and between the schist and trap roughly parallel each other at a distance of about 700 feet apart. Secondary enrichment has not played an important part. The only secondary minerals found, chalcocite and bornite, occur in small quantities.

The principal minerals are pyrite and chalcopyrite, with occasional stringers of galena and sphalerite. The non-metallic minerals are quartz, chlorite, and sericite. These are unimportant, however, as the percentage of

Mine Workings.

The main shaft No. 2 is down 300 feet, measured along the dip of the vein. At a point 165 feet south of the main shaft is the No. 1 shaft. This shaft is also an incline, sunk in ore with the exception of the first 19 feet, which is vertical. There are three levels open, th No. 1, 530 feet long, No. 2, 400 feet, and No. 3, 250 feet. The limits of commercial ore have not yet been reached on any of the levels. With the exception of No. 1 level all are being extended in ore. A winze has been sunk 60 feet below the third level. Each level is being thoroughly crosscut in laying out the mining system. Only 30 feet of work has been done in waste in the entire mine.

Mining.

In opening a new level a winze is sunk to the required distance, a drift is then run under the shaft and the raise driven to connect with the shaft at the level above. In this way hoisting in the main shaft is not interrupted by sinking operations, and much less water is encountered.

The cost of the shaft has been reduced from $30 to $12 per. foot, as well be seen, it is possible to use small hammer drills in the raise, and, since little water is encountered and there is no stoppage of hoisting in the main shaft, the work is carried on without interruption.

In drifting on a new level the foot-wall is followed as closely as possible. A second machine follows the first, making the drift wide enough for a double etrack.

The stoping method employed depends upon the width of ore to be stoped. For all widths less than 10 feet, stulls and lagging are used to support the broken ore in the stope, the chutes being placed at intervals of 15 feet. For widths over 10 feet and under 20 feet, a pillar is left over the level with chutes at every 20 feet in raises that have been run through the pillar. This pillar is from 20 to 15 feet thick measured along the foot-wall.

In preparing a stope of this kind, a sub-level is run 20 feet above the haulage level. These two levels are then connected with the raises at every 20 feet. At intervals of 100 feet raises are made to the level above to the used as manways, and to bring in the air pipes. For widths greater than 20 feet, cross-cuts are run for thirty feet to the limits of commercial ore. These cross-cuts are then carried up as shrinkage stopes. All stoping is done by the shrinkage system and all hoisting from one level in one to skips. A raise from the hoisting level to the level above is used as an ore pocket, and it is stored with several days' supply of ore.

Costs.

The following costs are computed from the first four months' operations in 1912:

Direct mining	$ .70
Development	.28
Surface handling	.21
General expense	.16
Property	.17
Total cost per ton	1.52

Supply costs per ton are as follows:

Candles	.01
Powder	.08
Oils	.02
Fuel	.10
Repairs and renewals	.08
Labor costs exclusive of drilling are	.44

Development costs (the work being done by contract

Drifting single track drift	10.00
Raising	8.00
Sinking winze, 10 by 6	14.00

Tramway.

A Bleichert tramway is being constructed from the mine to Copper Siding, a point on the Quebec Central Railway. The tram line will be 19,500 feet long and will cost at the rate of $1.75 per foot. Three hundred thousand feet of lumber, (board measure) was used in construction. The average height of tower was thirty feet. Construction was greatly handicapped by continual rain. Floods necessitated the placing of 14 towers and one tension station on pile foundations. The ore bins at the siding will hold two thousand tons, and the siding is arranged to handle the empty cars by gravity. The siding will accommodate twenty cars.

The line will handle 400 tons per day and is operated by a twenty h.p. engine. Coal and supplies will be brought back by the returning carriers.

QUEBEC COPPER INDUSTRY IN 1911.

In 1911 the production of pyritous copper ore substantially increased the shipments, namely 38,554 tons, exceeding the record since 1899. Apart from a small trial shipment made from the Eastman, the whole of this production was derived from, respectively, the Eustis mine at Eustis, and the McDonald mine, at Weedon. More extended notice is made to these mines elsewhere in this issue; but it may be added that recent development work at the Eustis has resulted in the blocking out of two years' ore supply; while it is also of interest to learn that the treatment of the ore by the Elmore process is being considered. Under the present management costs at the McDonald mine have been very materially reduced, and production at the rate of 2,000 tons monthly is being steadily maintained. The deposit is lenticular in form and of very considerable dimensions as indicated by the development work so far performed. The mineral content of the ore shipped last year averaged over 42% sulphur and nearly 5% copper.

Other copper mining operations in the Province included work at the old St Ives mine, near Eastman, where a promising body of chalcopyrite was uncovered; continued development of the Suffield mine; the unwatering of the Harrington; and the development of a number of claims in localities to the northeast of the McDonald mine, as well as in Lake Megantic region.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

ominion Coal Outputs.

The Coal Company's outputs in the first half of June tablished a new series of production records. The ıt put for the thirteen days of the first fortnight was ver 200,000 tons. In the week ending the 15th, the ily outputs were as follows:

Monday, 10th	15,144
Tuesday, 11th	17,007
Wednesday, 12th	17,648
Thursday, 13th	17,151
Friday, 14th	18,029
Saturday, 15th	14,286
	99,265 tons

The best previous day's output was 17,063 tons, obined at the end of April this year.

The outputs of the individual mines on the 14th June ere as under:

No. 1	2,163
2	3,376
3	435
4	1,667
5	1,073
6	1,130
7	775
8	693
9	1,990
10	863
12	1,232
14	1,211
15	624
16	585
21	143
22	69
	18,029 tons

It will be noticed that the new mines at Lingan are esponsible for 3,600 tons of this output, and in August is expected that these four collieries will be producing ,000 tons daily. No. 21 Colliery will obtain a much ineased output very shortly, and will probably be proucing 500 tons daily in two months' time. Barring the ossibility of accidents, never absent in mining operaions, it will not be surprising to see occasional daily utputs this summer of from 19,000 to 19,500 tons. The 0,000-ton mark will hardly be reached in the present eason, but it should be a possibility in 1913.

In a previous communication your correspondent reerred to the great drop in outputs which followed the ortnightly pay-days. This is well exemplified by the utput of 14,286 tons obtained on the 15th, which was he pay-day, compared with 18,029 on the day before. n the fortnight under review the output for the six ays, including and following the pay-day, was 86,000 ons, against 100,000 tons for the six days preceding he pay-day, or a shrinkage of 14,000 tons directly due o time lost by men after pay-day. It is a statement vell within the mark to say that if this pay-day loss ould be eliminated the Dominion Coal Company's oututs could be increased by at least 20,000 tons a month, nd that the miners' pockets would be correspondingly icher. As your correspondent has previously pointed ut, the sale of liquor being illegal in Cape Breton and he purveyor of liquor an outlaw, the purveyance of iquor is carried on without the possibility of regulaion as to quality, quantity or location. The logical esult is that bad liquor is sold, in unlimited quantity, n secret and shameless dives. The revenue which should be derived from a licensed traffic, a revenue that would be a most substantial assistance to education and roads, is lost altogether. Large sums of money are paid to inspectors under the Nova Scotia Temperance Act, as salaries, their duties being supposed to be the suppression of an illegal traffic. The fines imposed are frittered away on fighting writs of replevin, writs of habeas corpus, and all the puzzling and anomalous legal technicalities which are raised in never-ending succession by the resourceful lawyers of the liquor dealers, and which naturally arise out of the extraordinary state of affairs which tacitly permits an illegal traffic, much as one might say: "Your traffic is illegal, but we recognize that the law is impossible." A little impartial investigation of the actual conditions would convince all but the most prejudiced and intemperate prohibitionist that it would be far better to regulate this traffic legally than to perpetuate any longer a state of affairs which, while it recalls a comic opera in its topsy-turveydom, is actually pregnant with dreadful tragedy.

ONTARIO

Cobalt, Gowganda, and Elk Lake.

From Northern Ontario last month silver, gold, and nickel ore was exported, silver of course from the Cobalt camp, gold from the McEaneny, and nickel from the Alexo mine near the Frederickhouse. This is, of course, in addition to the silver bullion from Cobalt and the gold bullion from the McIntyre and Dome mills at Porcupine. The official shipments as compiled by Mr. A. A. Cole for the T. & N. O. commission reads:

Cobalt.

Mine	Tons.
Buffalo	92.24
Beaver	55.55
Chambers-Ferland	64.00
Cobalt Townsite	157.62
Colonial	21.60
Cobalt Lake	31.15
Coniagas	172.35
Crown Reserve	38.95
Drummond	18.56
Hudson Bay	62.75
Kerr Lake	50.77
La Rose	424.03
McKinley-Darragh	220.38
Nipissing	196.80
O'Brien	63.96
Temiskaming	197.64
Trethewey	60.37
	1,928.72

Porcupine.

McEaneny (gold)	30.99
Alexo Mines (nickel)	65.00

This ore was shipped as follows:

	Per Cent
Canada	46.97
United States	53.03

The lowest price of silver during the month was 60.125 cents, highest 61.375.

The Nipissing shipped ore of an estimated net value of $213,214 and mined ore of an estimated net value of $226,140.

At the Meyer vein on the 245-foot level two small but rich veins have been located.

At shaft 64 exploration work is in progress at 368 feet, but with no definite results so far.

An intermediate drift on a branch of vein 100 is now in 49 feet, and for most of this distance the vein shows good width and values. At the end of the month the face shows two inches of ore assaying three thousand ounces.

The new ore shoot found in April at vein 22 proved to have a length of 40 feet. The ore was very high grade and during the month stoping on the shoot produced $57,000.

The new shaft near the Savage line is down 178 feet, and is still in good coarse conglomerate.

The high grade mill treated 175 tons of ore during the month and shipped 298,973 ounces of fine silver.

Construction is proceeding rapidly at the new low grade mill, the frame work of all the main buildings being completed and a large part of the interior concrete work has been finished. Considerable supplies are already on the ground.

It is very probable that before this is published the Ontario Government will have announced a general reduction of the royalties to be paid by certain Cobalt mines. The mines likely to be affected and the present royalties rates they are paying are: Cobalt Townsite, 25 per cent. net; City of Cobalt, 25 per cent. net; Hargrave, 25 per cent. net; O'Brien, 25 per cent. gross; Crown Reserve, 10 per cent. gross; Chambers-Ferland, 25 per cent. net; T. & H. B., 15 per cent. gross, and various others that are not on the shipping list. The reduction will undoubtedly lead to increased activity among the companies affected as many of them have felt for some time that all the profit they were making or were likely to make would be skimmed off by the Government, and this had no tendency to accelerate shipments or encourage exploration. All mines, of course, have to pay the 3 per cent. royalty charge to the Government.

A report for five months issued by the Crown Reserve Mining Company shows that gross production was 1,143,142 ounces or $699,847 less all expense and depreciation $140,407, leaving a profit on mining operations of $559,438. The royalty for five months amounted to $64,346, and dividends paid monthly for five months to $442,203. The net surplus for the first five months of the year showed $52,889, and the total surplus now amounts to $817,741.

Work has been resumed on the John Black claims in South Coleman for the past month. The vein has been cut at the 300-foot level, and while it is from three to six inches wide and shows niccolite and smaltite the silver values are low at present. A development fund has been raised ample to carry on work for some time on the property.

The Wettlaufer has declared its regular 5 per cent. per quarter dividend, payable on July 20. The Wetlaufer has now paid 30 per cent. or $450,000. The Wettlaufer is now the only mine operating in the South Lorrain section, but there are prospects of quite a number of others commencing operations before long.

A good strike is reported from the Donaldson property at Elk Lake. A vein was followed down to the 100-foot level, but the silver in it was not sufficient to make it profitable for shipping nor was it much better in the drift till a point 40 feet from the shaft had been reached. The vein then, it is reported, widened to four to eight inches of two thousand ounce ore.

A two-stamp mill is now in operation on the Ruby Silver property near North Cobalt. The company in control is known as the Lost and Found Mining Co. of Buffalo. The mill is for the purpose of testing the ore.

The Nova Scotia mill, now the property of D. M. Steindler and his associates, has opened up again as a customs mill. Before the Nova Scotia Company went into liquidation it had obtained contracts from the Crown Reserve and the Kerr Lake to mill their low grade ores so many tons per month. The fact that the company went into liquidation rendered the contracts null and void, but they have been renewed with the owners of the present mill.

The annual report of the Buffalo mines shows that the total production during the year amounted to 1,525,262 ounces, while the ore reserves were approximately increased by 41,000 tons of a value of 38 ounces per ton, or 1,500,000 ounces. These reserves are principally on No. 10 vein. The mill treated 46,801 tons averaging 32.36 ounces per ton, a total of 1,490,760 ounces, of which 80.63 per cent. was recovered. The income from mining operations amounted to $853,807, while the net income was $451,154. The dividends paid during the year amounted to $370,000, and $81,154 was added to the surplus, which now amounts to $389,577.

The Casey Cobalt has just shipped a car of ore weighing over 47 tons, which is to date the richest which has ever left the Cobalt camp. It was valued at $132,235, which is about $5,000 more than the previous highest car from the Temiskaming mine.

The Hollinger mill dropped thirty stamps on June 15 and the mill should be running on ore within a few days. It is too much to expect that any tonnage can be attained before the first of July as only thirty of the forty stamps have as yet been installed, and there is a lot of work to be done yet before it can be said that the plant is in good running order.

The Vipond mill has been unduly delayed by the non-arrival of one ten horse power motor. The mill has now been ready to start for two or three weeks if this particular piece of machinery had arrived.

At the Dome mill all difficulties have at length been overcome and the mill should soon be treating full capacity. At present about 300 tons are being treated daily. All the tube mills are at length in commission. The incomplete returns which have from time to time appeared in the press have been so inaccurately used to arrive at the output that the management has taken the greatest pains to see that not even the amount of gold that is being shipped from the mill should get known. It is possible that when the mill is running smoothly the embargo on all information will be lifted. It is understood that the ore in the mill is running about $11.50 to the ton.

The Little Pet mine has closed down so that it is probable that the five-stamp mill in course of construction there will figure as one of the camps bullion producers.

The main vein of the Swastika mine has been opened up at the 400-foot level and shows from four and a half to five feet wide of solid quartz. It was cut but 25 feet from the shaft. This is the best width of quartz that the mine can show except at the 100-foot level, the ore body being badly broken up at the 300 and the 200-foot levels. If the assays hold up in the new ore body this strike will very greatly enhance the value of the property.

Development at the Dome Lake mine continues to be very satisfactory. On the No. 1 vein the shaft is now down 48 feet and at this depth there is quartz all across the working. This does not appear to be of such high average value as in the main vein, but it should be all good pay ore. A complete compressor plant is being installed and a site has been chosen for the erection of the ten stamp mill.

It is understood that the Lucy Cross at Swastika will erect a five stamp mill. It will cost about $7,500 to erect. The vein was lost at the 100-foot level, but has recently been opened up again in a raise where it is rich as it was on the surface.

BRITISH COLUMBIA

A statement published recently in Nelson was that a visitor from Chicago "remarked upon the large sums of United States capital which are being spent upon the development of such mines as the Payne, the Rambler-Cariboo, the Rio, the Standard and numerous other properties in various parts of Kootenay, in addition to the Mother Lode at Sheep Creek, where the big mill is about to produce gold." This is misleading, at any rate so far as the Standard and Mother Lode are concerned, while it is also incorrect to suggest that a a "large sum" has been spent in developing the Rio, which as yet is a comparatively unimportant property and has never had any considerable number of men employed on it. As to the Payne, it is true a long crosscut tunnel is being driven, but it will be some time before it can be correctly stated that a "large sum" of money has been spent on its development by United States capitalists. Now, in calling attention to this instance, which is only one of many, of incorrect "mining news" being published in Nelson, there is no intention to attempt to disparage mining men resident in the United States in relation to their enterprise in developing mining properties in British Columbia. In a general way it may be stated that they are doing, and have done, more to develop the mineral resources of this province than Canadians and Old Country people combined. But inaccuracy is characteristic of other newspapers as well as that published at Nelson, when printing information—or, frequently, mis-information—relative to mining in the province. Take, for instance, the reference in the above quoted newspaper statement to the "big mill" of the Mother Lode at Sheep Creek how can it be truthfully maintained that a 10-stamp mill is a "big" mill? This is not suggesting that that mill is not a good one, for its equipment is modern and it is quite likely it will be found one of the most effective gold-saving mills in the province. Then as to United States capital taking a prominent part in the development of the Mother Lode mine, Ontario readers of the Canadian Mining Journal will smile at the suggestion that Mr. John McMartin, of Cobalt and Porcupine fame, is one of the United States capitalists the Nelson newspaper includes in its generalities when it publishes statements like that here challenged. Yet Mr. John McMartin is president of (and chief shareholder in) the Mother Lode Sheep Creek Mining Company, Mr. Duncan McMartin is vice-president, and Mr. L. H. Timmins is also a director. Then as to the Standard, for years the development work of this mine has been paid for out of proceeds of ore extracted in the course of that development. During 1911 the Spokane men largely interested in it doubtless found money for an aerial tramway, concentrating mill, compressor plant and water system for power and mill purposes, but notwithstanding that the mill was not completed and ready for operation until November last. In April the Standard Silver-Lead Mining Company paid a dividend totalling $25,000, and in May and June $50,000 each, with the expectation that it will be found practicable to regularly divide $50,000 a month among the shareholders. As regards other properties, it is true that United States men are largely interested in mining in Kootenay and Boundary districts, but only in a comparatively few instances have they supplied "large sums" of money for the development and equipment of mines in those districts, much of the cost of these having been obtained from the proceeds of ore taken out of the mines acquired by those men.

South Belt of Rossland Camp.

The development of several mining properties in the south belt of Rossland Camp, although not yet on a large scale, appears to be giving encouraging results. Those of which the Rossland Miner has published most information during the last few months are the Bluebird, Phoenix and Richmond group. On June 5, some particulars were printed of progress on two of these.

The lessees of the Phoenix were stated to have had —at the beginning of June—some 300 sacks of ore ready to be sent to the smeltery at Trail as a trial shipment. The lode from which the ore was taken was described as being three feet wide, with paystreaks of high-grade ore, about a foot in width, on both hanging and footwalls. The ore is described as being fine-grained pyrrhotite, containing little copper, but averaging about $30 per ton in gold.

A second find of ore on the Hattie claim of the Richmond group was reported, this being about 200 feet from where ore was found three weeks earlier. The lode was stated to be 15 feet in width, and to have been found to run parallel with a dike for several hundred feet.

The Miner urged local residents to show the utmost faith in the mining properties in the south belt by putting money or its equivalent, labour into the further development of claims in that part of Rossland Camp. It commended the energy of local miners who have to some extent shown the possibilities of this part of the camp, and expressed the opinion that if this home effort be kept up and several regular shipping mines be established as a result, there will not long be a lack of capital for further development of the resources of the camp, and the maintenance of its prosperity.

Windfall Group, Hedley Camp.

The Windfall group of mineral claims, adjoining the Nickel Plate on the northwest, in Camp Hedley, Similkameen, has been taken under bond and option of purchase by the Hedley Gold Mining Company, owners of the Nickel Plate group.

Mr. Charles Camsell, in his Memoir No. 2, "The Geology and Ore Deposits of Hedley Mining District, B.C.," stated that "the first record of a mineral claim in Camp Hedley was in 1894, when C. Allison and J. Reardon staked three claims for the Hon. E. Dewdney and others, on ground that is now covered by the Climax, Windfall, Winchester, Lookout, and part of the Nickel Plate mineral claims. Mr. Coulthard also had a claim on what is now the Kingston mineral claim. These four claims were recorded at Granite Creek, but they were not considered worth the annual assessment duty, and were allowed to lapse."

The Hedley Gazette, which, on June 6th, announced the recent transaction above mentioned, included the following in its comments:—"Nobody knows much of the value of the property except the purchasers, who doubtless have evidence from their underground workings, though it was a comparatively easy matter to arrive at the conclusion that their situation meant much. This was apparent as soon as work was resumed in No. 4 tunnel of the Nickel Plate and ore extraction and development have gone on so extensively since then. What it means for this camp is simply this: it has most effectively exploded the old theory that the Hedley Gold Mining Company had within its 20 odd claims all that was of value in the camp." The Gazette further stated that the purchase price is $150,000.

The Blue Bell Mine, Kootenay Lake.

While little is being published concerning what is being done at the old Blue Bell lead-silver mine, situated opposite Ainsworth, on the eastern shore of Kootenay Lake, it is known that good progress is being made with the installation of new plant and machinery requisite for the development of the mine below its main adit level, and enlargement of the capacity of its concentrating mill.

The Blue Bell has a noteworthy history, dating back to its discovery in 1825 by David Douglas, a Scottish botanist, who was investigating flora of the Kootenay Lake country. In the sixties the late Senator Hearst, of California, endeavoured to turn its ore to profitable account, but failed, and then in the eighties Dr. Hendryx and his Minnesota and Connecticut associates organized the Kootenay Mining and Smelting Company and acquired the property, in connection with which, about that time there was the quarrel between Hammill and Sproule, which resulted in the latter shooting the former and afterwards being hanged for the crime. Eventually the property passed to the possession of the Bank of Montreal. In 1905 it was purchased from the bank by the Canadian Metal Company, Ltd., and now it is owned by the New Canadian Metal Company, of which Mr. S. S. Fowler is general manager.

Figures showing the aggregate output of ore from the Blue Bell mine are not at present available, but it is known that there was shipped to the old smeltery at Pilot Bay during fifteen months ended March 31, 1896, 67,185 tons. During 1906 more than 10,000 tons was shipped by the Canadian Metal Company, also to Pilot Bay. By June, of 1908, the concentrating mill near the mine was completed, and between then and March, 1910, approximately 90,000 tons of ore was milled there. Reorganization of the Canadian Metal Company, which is a French proprietary, took place in 1911, and early in 1912 the work now being proceeded with was undertaken. There is still much ore in the mine, so it is expected that production on an important scale will be continued for a long time after the improvements now in hand shall have been completed.

Boundary District Notes.

From the Phoenix Pioneer it is learned that the Phoenix Mining, Smelting and Development Company has let a contract for development work to be done on the Duncan group of mineral claims, situated near Beaverdell, on the west fork of Kettle River, and recently bonded by that company. Silver-lead ore of good grade was shipped from this group in 1909.

The Riverside Mining Company, now that its Riverside mine, situated on Kettle River, a few miles above Rock Creek, has been connected with the railway by a spur, will ship ore to the Granby smeltery at Grand Forks. For the present it is intended to ship three carloads a week. The development of the mine was continued throughout last winter.

The quantity of ore produced by Boundary district mines during five months to June 1 was about 825,000 tons, of which approximately 483,000 tons was from the Granby Company's mines, and 342,000 tons from those of the British Columbia Copper Company.

According to the Boston Commercial, Mr. Newman Erb, president of the British Columbia Copper Company, had issued a formal statement to the effect that the executive commiteee would recommend to the directors at the next meeting of the board the resumption of payment of dividends at the rate of three per cent. (15 cents a share) quarterly only. The company is stated to have enough cash and metal in transit to pay a full year's dividend at that rate. The production of copper in May was 1,054,000 lbs., which was the largest output for any single month in the history of the company. Net earnings for May are reported as having been $58,000.

From the Commercial it is also learned that the Granby Company will not begin construction work on the proposed new smeltery at its Hidden Creek property, on Observatory Inlet, until it has opened by underground workings, the large ore body which the diamond drill indicated contains considerable two per cent. ore. This work will take from four to five months to do.

General Mining Notes.

At the end of May the long low-level cross-cut tunnel being driven at the Slocan Star mine, near Sandon, Slocan, was in about 1,200 feet.

A long cross-cut tunnel is being driven at the Britannia mine, near Howe Sound, New Westminster mining division. When this shall be completed, ore will be conveyed from its portal down to the concentrating mill at Britannia Beach over an electrically-operated tramway.

The British Pacific Coal Company has been inviting tenders for an aerial tramway from the pitmouth to tidewater, the buckets to be suitable for conveying coal. A capacity of 300 tons in ten hours was to be provided for. Bids have also been asked on construction of a pier, or a loading wharf and a bunker at Skidegate Inlet, Graham Island, Queen Charlotte group.

The report that the Red Cliff Mining Company, which is developing a copper property in Portland Canal mining division, about a dozen miles from Stewart, had obtained an option on a controlling interest in the shares of the Tyee Copper Company, Ltd., has been confirmed by news from London, England. The Tyee smeltery at Ladysmith, Vancouver Island, has two blast furnaces of modern type, and is otherwise well equipped for smelting copper ore.

Production of Rossland mines during the first five months of 1912 has been at an average of rather more than 20,000 tons a month of ore. Of this output, a total of approximately 97,000 tons for the whole period has been received at the Consolidated Mining and Smelting Company's smeltery at Trail. A comparatively small quantity was put through the Le Roi No. 2 Company's concentrating mill, which treats the ore of too low a grade for shipment to the smeltery without concentration.

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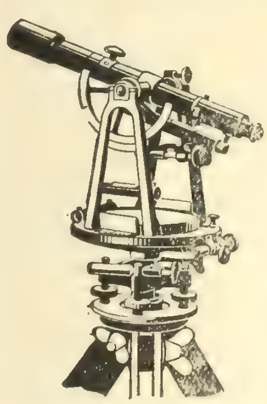

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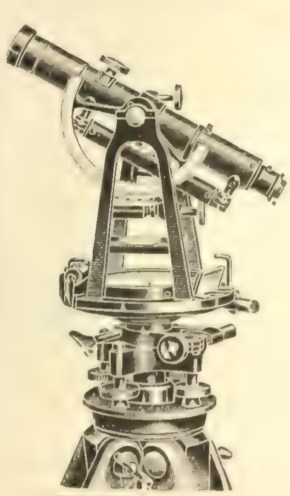

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to nsult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also ongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. iose who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with iom they place their business.

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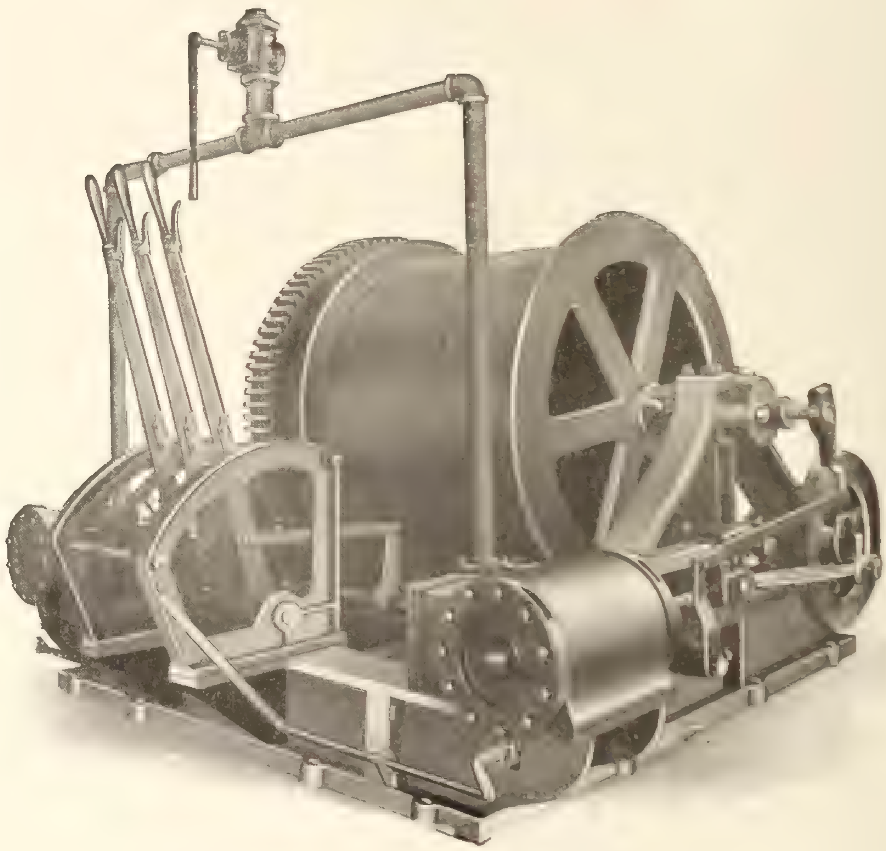

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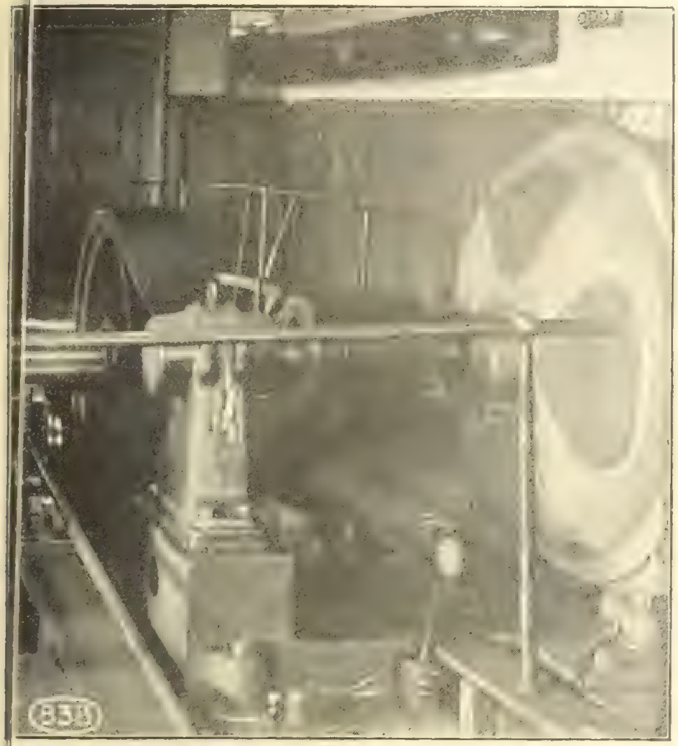

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THE CANADIAN MINING JOURNAL

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CONTENTS.

ORGANIZED LABOUR IN CANADA.

The Department of Labour, Ottawa, has added to the list of its instructive and timely publications a report on Canadian labour organizations. The recent history of some of these organizations in Canada has been marked (and marred) by many regrettable incidents, due principally to affiliation with United States bodies. It is important, therefore, to know just how far Canadian labour is dominated by extraneous influences. It is important, also, to see how much independent national organization has taken place. The report before us is entirely devoted to facts and figures. It is, as it should be, non-partizan.

The oldest labour union in Canada is the Toronto Typographical Union, established in 1844. To-day there are no less than 1,741 local unions, most of which are branches of large central bodies. The membership rolls of these local unions contain from ten to over one thousand names. In Ontario there are 706 local organizations, in British Columbia 234, in Quebec 205, in Alberta 153, in Nova Scotia 138, in Manitoba 118, in Saskatchewan 84, in New Brunswick 73, and in Prince Edward Island 7. The four largest cities, Montreal, Toronto, Winnipeg and Vancouver, comprise about one-fifth of the whole total, the western cities having proportionately the larger number.

In the industries of mining and transportation and in a few trades the methods of organization and procedure are much more complicated than in other callings.

Of the 1,741 local unions, 1,531 are in affiliation with international associations, the remainder being entirely Canadian. Welding together the various units of all trades are two general organizations, the Trades and Labour Congress of Canada, in which are represented the societies that have international connections; and the Canadian Federation of Labour, which has to do with purely Canadian unions. Both these bodies meet once a year.

Of the several advantages claimed for the principle of internationalism, that of the "travelling card," which gives members the privilege of moving from place to place, irrespective of the boundary, is the only one that can be admitted without argument.

The American Federation of Labour claims the loyalty of 78 of the 91 international unions having branches in Canada. It is by far the largest organization of its kind on the continent. With it is affiliated the Western Federation of Miners.

The largest individual trade union organization in Canada and the United States is the United Mine Work

ers of America, with 277,050 members in the States and 12,950 in Canada. This marked disparity is significant enough.

As we are concerned primarily with mine labour we shall restrict our further remarks to those organizations that have to do with mining, quarrying and ore reduction.

Three international bodies are represented in the mining and quarrying industries of Canada. These are the United Mine Workers of America, the Western Federation of Miners, and the International Quarry Workers Union of North America. Of similar Canadian bodies there are two, the Provincial Workmen's Association and the Canadian Granite Cutters' and Quarry Workers' Union. In addition to these there are numerous local societies that have no branches and no outside connections.

The three international organizations mentioned above have, respectively, 50, 23 and 4 branches in Canada; while the Provincial Workmen's Association has 22 branches. The Canadian membership of the international bodies mentioned are, respectively, 12,950, 5,196 and 100; while the P. W. A. has 4,000 miners enrolled.

It will be seen that United States organizations absolutely dominate mining labour in Western Canada. The Provincial Workmen's Association is a Nova Scotian organization which received a strong impetus several years ago in a protracted fight with the U. M. W. A. While it is a vigorous society, it covers but a small area.

THE LAW OF THE PAY-STREAK.

In our issue of June 1st, 1912, we reprinted from the Bulletin of the Institution of Mining and Metallurgy, a paper contributed by Mr. J. B. Tyrrell, "The Law of the Pay-Streak in Placer Deposits." On this subject little has heretofore been written. Mr. Tyrrell's object was to correlate and classify observed phenomena and to demonstrate the applicability of certain simple natural laws governing the concentration of heavy metals and minerals in alluvial deposits. Elusive as the placer pay-streak may seem, it is nothing more or less than a "feature in the structure and growth of the valley in which it occurs, its formation is governed by certain geological laws, and those laws should be recognizable without great difficulty if the growth of the valley can be traced with reasonable accuracy."

While Mr. Tyrrell's facts were gleaned in the Yukon, his generalizations are meant to have the widest possible application, and to throw light upon the problems of prospecting for placer gold.

The latest Bulletin of the Institute, No. 93, contains a highly interesting discussion of Mr. Tyrrell's paper. It is timely to note here the trend of the criticisms offered.

Mr. Newton B. Knox demurs strongly to Mr. Tyrrell's conclusions. The valleys of the Klondike, says Mr. Knox, are ideal for concentration. Natural conditions there approach those of a long sluice with rapidly flowing waters, regular gradients, rough bottoms, and few or no floods. In regions subject to sudden floods, the laws enunciated by Mr. Tyrrell would break down. In answer to this we may remark that Mr. Knox is misinformed concerning the Klondike. Floods are severe and not infrequent in that territory. While the rivers do not become torrential, yet, even where they do, the problems to be solved as regards the concentration and disposition of placer gold differ in degree rather than in kind.

Mr. C. W. Parington follows, in the main, the line taken by Mr. Knox, and suggests that Mr. Tyrrell's hypothesis as to the V-shaped river valley needs modification when applied otherwheres than in the Klondike.

While both critics have a certain amount of right on their side, we believe that both have missed the real point of Mr. Tyrrell's paper. That point lies in the fact that Mr. Tyrrell has demonstrated that geological laws govern the deposition of placer gold. Experience in different countries may modify the laws; but a grasp of the philosophy of placer gold will inevitably aid the prospector, no matter what the local conditions may be.

Incidentally, it is refreshing to note that Mr. T. A. Rickard has his terminological fling in the course of the discussion. He objects strongly to the compound word "pay-streak" as being local, restrictive, and vicious. "Gold-bearing channel" is the substitute suggested. Unfortunately, the substitute is too lengthy to meet the requirements of a time-saving age.

REFINING SILVER AT THE MINE.

We quote elsewhere in this issue from an article recently contributed by Mr. T. A. Rickard, to the *Mining Magazine*, descriptive of the refining of silver at the Nipissing Mines. This innovation, which, we understand, is about to be adopted by at least one other important mine in the Cobalt district, will effect not only a large direct saving in marketing costs, but the practice now followed will enable the bye-products of the ores, notably cobalt oxide, to be conserved for future profitable realization. The demand for cobalt oxide is limited, as was also the supply prior to the discovery and operation of the Cobalt mines. The quantity thus made available demoralized the market, but eventually, without doubt, prices will return to their former level. Since, however, in most cases the smelters have made no allowance for Cobalt in ore-consignments from the district, the local recovery of this metal, even if marketted at obtaining prices, will mean so much additional profit to the mines adopting this course.

COBALT DIVIDENDS.

It is satisfactory to note that the dividends paid by the Cobalt mines continue to be well maintained. The

ıounts distributed during the first half of the present ·ar, by thirteen companies—in this case a lucky num-·r—representing well over three and a half million ›llars, the percentage rates being from 3 to 900 per nt. Thus two companies are paying at this minimum ıte, one is distributing 4 per cent. on the capital; three) per cent.; three, 15 per cent.; one 16 per cent.; one) per cent.; one 30 per cent.; and one 900 per cent. his latter, the Hudson Bay, is capitalized at a very low gure.

FRENCH'S ZINC PROCESS.

Mr. A. Gordon French achieved much publicity by laiming to have developed a commercially practicable rocess for treating the Slocan (B.C.) zinc ores. His lectrolytic zinc product, he states, is pure and easily ıarketable at a profit.

Without expressing any opinion as to the merit of the 'rench's process, it may be of interest to outline the arious steps taken.

The commercial recovery of zinc from the silver-lead-inc ores of the Slocan district has long been an unsolved ›roblem. The zinc concentrates on which Mr. French ıas worked, contained galena, zinc-blende, iron-pyrites nd siderite, along with quartz and shale as gangue. \fter crushing to ten-mesh, the material is given a near-y "dead" roast. About five per cent. of nitre cake is hen thrown on the ore and thoroughly mixed with it ınd the whole heated once more. Since there is free sul-›huric acid in the "cake," the oxides in the ore are con-·erted into sulphates. About fifteen minutes is allowed 'or the reaction, and the ore is then removed from the furnace and cooled. After transference to a wooden eaching-tank, acidulated water is added to dissolve the ›xides and sulphates of zinc and to remove the sulphate of soda. Insoluble lead and silver compounds remain in the tank with the gangue. It is claimed that the sul-phate of iron is not leached out until all the zinc is dis-solved, and that it can readily be left in an undissolved condition.

The filtrate is run into a wooden box in which are hung alternate sheets of zinc and lead, the zinc connect-ed with the positive pole and the lead with the negative pole of a low voltage direct-current dynamo. Metallic zinc is deposited in a hard mass on one side of the zinc plates, the plates are removed, the deposited zinc strip-ped off and melted. Black oxide of manganese is de-posited on the negative lead plates, and is brushed off and collected. It is of commercial value. The filtrate, after electrolysis, is pumped back to the leaching-tank.

Mr. French's plant at Nelson is a rough experimental outfit, capable only of treating from 500 lbs. to 1,000 lbs. at a time.

The electrolytic zinc contains 99.5 per cent. of zinc, 0.5 per cent. copper, and 0.2 oz. silver per ton.

EDITORIAL NOTES.

Bush fires have been raging near and round Porcupine. Preventive measures seem no more effective now than in the past. An efficient patrol system is a necessity.

Our Quebec Special Issue has been received with marked favour by our readers. This, of course, is gratifying. Our hope is that succeeding special issues will be even more successful.

The net income of the International Nickel Company was $4,866,412 during 1912. The only year in which the figure was exceeded was 1911, when the net income of the concern was $5,028,874.

Captain Munn, well known to northern Ontario mining men, is off for Baffin's Land in the good ship "Algerine." With him is Captain Bartlett, formerly the companion of Peary. With him, also, is much hope and confidence. The "Algerine," by the way, was at one time a respected unit of the British navy. Dr. A. P. Low used her on several sub-arctic expeditions.

Many fantastic estimates are being published of the tonnage of ore being crushed in Porcupine stamp mills. At those mills where the practice followed includes tube mills and the ore, consequently, is stamped to a mesh coarser than 20, the stamp duty will probably range between 5 and 8 tons per day . Where tube mills are not installed, the duty per stamp will certainly not exceed 6 tons per day, and may be much lower.

Mr. A. A. Cole, mining engineer for the T. and N. O. Railway, predicts a long life for Cobalt. No one is in a better position to know the facts than Mr. Cole. He is thoroughly conversant with every phase of mining in Cobalt and occupies an important official position. With no axe to grind, his deliberate utterances may be taken as being humanly correct.

Among the Canadian members of the Canadian Mining and Exploration Company, are Sir William MacKenzie, Sir Thomas Shaughnessy, Mr. C. R. Hosmer, Mr. T. J. Drummond, Mr. D. Lorne McGibbon, Mr. David Fasken, Sir Henry Pellatt, Mr. R. B. Watson, and Mr. George E. Drummond. All of these gentlemen have had a great deal to do with mining in this country. A more representative list of names could hardly be selected.

CORRESPONDENCE

GOLD MINING IN NOVA SCOTIA.

Editor Canadian Mining Journal:—

Since reading Mr. T. A. Rickard's letter published in your issue of November 1, 1911, in sheer justice to the neglected industry of gold mining in Nova Scotia, I have had a desire to question Mr. Rickard's final thrust, but because of other duties, until now, it has not been convenient for me to do so.

In drawing and officially reporting to the Provincial Government his conclusions and repeating the substance thereof in the letter above referred to, viz.: that the gold deposits of Nova Scotia are inconstant, do not hold with depth, and consequently are not of sufficient promise to justify investment of large capital, in the main I believe Mr. Rickard to be absolutely wrong.

I attach hereto, in part, a report made by me, date of January 17, 1911, after eight months service in the Oldham gold district, N.S., as manager of the Sterling gold mine.

Supported by the statements of fact contained in that report I wish to make the unqualified assertion that the history of at least one mine, the Sterling, said to have reached the greatest depth of any gold mine in Nova Scotia, and the showing as known to have been left in its workings at the close of 1910, offer positive and indisputable evidence of the error Mr. Rickard fell into and to which, through your excellent publication, he has given such wide publicity.

Elsewhere in that letter to you Mr. Rickard states that "Gold mining on a large scale has rarely proved profitable in Nova Scotia."

Excepting it may be the Boston and Richardson, which I understand was a very low grade proposition substantially from start to finish and extravagantly managed at that, gold mining in Nova Scotia has never in a single instance been conducted upon what could be rightly considered a large scale.

The Sterling would probably rank next, but throughout all the years of its operation, when working at its maximum of three shifts in 24 hours, the Sterling never employed more than 35 men underground daily, not more than eight of whom during any shift were on the drills, two men to each machine, and this maximum was exceptionally rare.

Had but a few intelligently located gold mines in this Province been even as crudely worked but pushed to depths approximating that of the Sterling, the results would undoubtedly have furnished much additional proof of Mr. Rickard's mistake.

In his unfortunate estimate of the value of the gold deposits and of the recurrence of ore shoots in Nova Scotia Mr. Rickard's conclusions were evidently arrived at (1) by what he saw and hurriedly examined; (2) by what he was told by others who may or may not have been biassed, and (3) by geological theories in which he is exhaustively learned and highly expert. Probably not having personally examined the Sterling, nor any gold mine in the Province approaching its depth, during the few weeks he was dashing over the hundreds of square miles of gold areas, and as his personal examinations were probably confined to mines of shallow depths, such information as he gathered of a reliable and materially practical character must have been narrowly circumscribed and decidedly insufficient as a base for the vastly important report expected from him.

Hence it is quite reasonable to contend that Mr. Rickard's lamentable verdict was reached far too hastily and without seeking or acquiring a full and authoritative knowledge of actual representative conditions which had been exposed and were readily open to him.

In justice, however, to Mr. Rickard the writer believes and is free to say that had that gentleman given the gold mining probabilities of Nova Scotia as much personal investigation and close study as he gave the Stratton Independence in Cripple Creek, Colorado, some twelve years or so ago, his report in 1905 to the government of this Province would doubtless not have been kept from the general public ever since.

Mr. Rickard's more recently published compilation of the opinions of others arrived at and given to the public during the past century and long before sinking had been done to anything but shallow depths, whilst clever and profound, stands out clearly and directly at variance with facts of great importance subsequently developed.

Halifax, N.S. EDGAR H. BRENNAN.

June 17, 1912.

The Oldham Gold District—Sterling Mine.

The Oldham gold mining district is located in Halifax County, Nova Scotia, three miles by wagon road east of Enfield Station on the Intercolonial Railway, Enfield being twenty-eight miles by rail from Halifax City.

Formation.—The country rock is quartzite, locally known as "whin," which, at remarkably frequent intervals, encases veins or "leads" of light to medium tints of grey and blue quartz, bedded, as a rule, in several inches of firm, consolidated shale or slate.

It would seem that originally the quartz veins were flat, of a blanket character, but at a later period presumably because of eruptive disturbance, in common with the quartzit encasing them, were lifted en masse and left in the form of an elongated dome, or similar to that of an inverted hull of a ship, bow to the east, lines drawn in sharply at north and south sides, still more closely at the west end and, with some irregularity, the keel representing the anticlinal apex.

From its eastern extremity the dome pitches to the west at a slight angle and on their course or strike the quartz veins describe irregular curves of wide but varying radius first northerly and southerly from their eastern intersection with the break, or so-called "nose" and then in each instance swinging westerly to their westerly intersection of the anticlinal break. Thus of easy angles averaging at and near surface about the leads at the "nose" are given dips to the east 35 degrees from the horizontal down through the quartzite; whilst the leads as extended around on the north and south sides, or "legs," having been drawn inward, stand at much greater dips, averaging more then 65 degrees.

The quartz throughout the district is mostly well mineralized, the leads varying from one-inch to two feet in thickness, the gold content being generally free, although the sulphides carry more or less.

Operation.—Whilst nearly all the leads have to some extent been prospected here and there, and in most instances found to carry more or less gold at or near surface, a number have been worked somewhat deeper, producing good pay ore and from a few worked to a maximum of 450 feet in depth, large quantities of gold and heavy profits were realized.

The most important mine is the Sterling, which has been worked more or less for 14 years. In July, 1910, this mine reached a depth of 1,589 feet on the dip of the lead, whereupon further sinking ceased. The angle of dip of this lead will probably average 40 degrees from collar of shaft to bottom of mine. The general bearing of the shaft line is about N. 78° E., and nearly parallels the course of the anticlinal axis, keeping 50 feet or more to the south. At no time have the levels nor has stoping been carried far either way from the shaft, or hoisting line; in fact, the drifts in either direction from the hoisting line have never averaged 100 feet in length.

Although the lead has held continuously from surface to bottom of mine and still holds, in common with nearly all rich gold-bearing veins, both thickness and gold values have varied, the thickness from one to nine inches—the latter occurring at the bottom—and the gold content from one-half ounce to six ounces or better in gold per ton of quartz, not including the occurrence of occasional pockets from which quartz has been taken and milled yielding up to 150 ounces gold per ton. Thus, it is apparent that from the opening of the mine, not only the lead, but the ore-shoot as well has been substantially continuous to the present depth of 1,589 feet, where it still exists.

Production.—The writer has no authentic data at hand of the gold output of the Sterling mine prior to 1903, but beginning with May 18, 1903, and ending Jan. 29, 1907, embracing a period of 44 months, as officially reported to the Provincial Mines Office, the production was 1,886 tons quartz, from which 3,188 ounces of gold were extracted, the bars selling at an average of $19.70 per ounce. During this period of 44 months, because of fire and other reasons, the mine was not operated continuously, frequent breaks intervening, each of several months duration.

During the calendar year 1910, since the close of which the mine has not been operated, the Sterling produced 847 tons quartz, from which 1,895 ounces of gold were extracted. The owner of the Sterling states that in 1908 and 1909 the gold values produced averaged $4,000 per month for the entire 24 months. Thus, it is shown that during the last seven years of operation the value of the Sterling's production of gold in round figures was $170,000, and all realized from a single shoot of pay-ore holding continuously to a depth of 1,589 feet.

At the 1,200 level, about 90 feet south of the hoisting line, in an effort made by the writer during the last three months of 1910 to prove the existence of other ore-shoots in the Sterling lead, a reef of extremely hard ground was first encountered. This was penetrated, proving to be a width of 30 feet, after which the ground or, we will say the new ground, broken into south of the hard reef was found to be similar to and quite as easy to break as was the old ground at any point in the old workings. This drift in the new ground was driven 84 feet further south—from the hard reef—and slightly overhead or back-stoped close to the south edge of the hard reef, uncovering quartz there which proved thin and tight, but good for one ounce of gold per ton. Another short raise was made near the south end, or breast, of this drift, uncovering quartz which was much thicker, not so tight, and which milled six ounces gold per ton; and from a pocket of 32 pounds, of which better than three ounces of gold was extracted, thus milling at the rate of $3,600 gold per ton of quartz.

Conclusion.—From close study of the Sterling Mine during 1910, the writer became convinced that, if properly worked, a liberal extension and stoping southerly of at least the ten levels from the 400 down to the 1,300, inclusive, would for many years to come be productive of extremely handsome profits. And with the installation of suitable equipment, sinking could also be resumed with excellent profit, as the quartz across the entire 100 feet of bottom, although carrying but half to three-quarters of an ounce gold per ton, averages quite 8 inches in thickness.

Of the other leads in Oldham, 45 ro more of which come to the surface, with a few exceptions heretofore referred to, none have been really mined, simply prospected to depths which would not average more than 50 feet over the entire district.

EDGAR H. BRENNAN,
Mining Engineer.

Oldham, N.S., Jan, 17, 1911.

IRON AND STEEL.

Commenting on a paper read by Dr. W. H. Walker, before the New England Waterworks Association, discussing the relative corrosion of iron and steel pipe, Water and Water Engineering remarks that no controversy of recent years has aroused more widespread interest than that which has centred round the question of the origin and mechanism of corrosion in metals. In elementary text-books on chemistry, the oxidation of iron and steel has often been brought forward as a typical example of a chemical reaction of a simple kind, yet chemists are not even yet agreed upon the details of the process by which the reaction is produced. Dr. Walker shows how easy it is in comparative experiment to obtain discordant results with material of varying quality. Thus, if iron of poor quality is compared with good steel, the result may be in favour of the steel, whereas if the steel is inferior and the iron exceptionally good, the reverse will be the case. Dr. Walker concludes from his investigations that "on the average" there is no difference in the corrosion of iron and steel pipe. An interesting result obtained in this investigation was the proof that no reliance can be placed upon the accelerated acid test, which did not agree with the Service tests, nor did it produce concordant results with regard to either iron or steel alone. It may here be mentioned that Dr. Walker's conclusions agree substantially with opinions expressed in a paper on a similar theme contributed to the Canadian Mining Institute by Mr. F. N. Speller some years ago.

RAINY HOLLOW, B.C., AND SOUTHWESTERN YUKON

(Contributed by E. Jacobs, Victoria, B.C.)

For some years efforts have been made to obtain capital for the construction of a railway from Haines, on Lynn Canal, south of Skagway, through United States territory, and thence across the extreme northwestern part of British Columbia and the much larger southwestern part of Yukon Territory. As the British Columbia section of this northern country has recently once again attracted attention, and is a part likely to receive still more notice in the future, the following information, taken from two or three available sources, is contributed with the idea that it will likely prove of interest to a number of readers of the Canadian Mining Journal.

The proposed railway would be in three sections: First, from Haines to the British Columbia southern boundary; second, across Canadian territory to the Alaskan eastern boundary; and third, through interior Alaska to a northern terminal on Yukon River. Part of the information relative to the first and second sections, that will presently be given, has been extracted from a description of the country prepared for the promoters of the railway above mentioned. Before quoting this, though, some particulars of the country south of the 60th parallel, from the official report of the Provincial Minearalogist as printed in the "Annual Report of the Minister of Mines for British Columbia, 1907," will be given, as follows:

From Haines, Alaska, to Rainy Hollow, B.C.

"Rainy Hollow is the name locally given to the basin surrounding the headwaters of the Klehini River, a tributary of the Chilkat River, which it enters from the west. The Chilkat River and the Klehini River both have their sources in the territory formerly comprising the Chilkat mining division of British Columbia, but which is now included in the Atlin mining division, of which it forms the northwestern part. Both these rivers, about midway in their course, pass out of British Columbia into Alaskan territory.

"Between Bennett Lake in British Columbia, on the line of the White Pass Railway, and the Chilkat River, there is a range of high mountains, which it is impracticable to cross, even with a pack-train, so that the only way to reach the Rainy Hollow Camp is through Alaskan territory. The route usually taken to the camp is from Skagway, Alaska, by a small gasoline launch, which runs daily to Haines Mission, and important U. S. military post, thence by wagon road a distance of a couple of miles across the peninsula to Chilkat Inlet, into which the Chilkat River flows. Here Indians and canoes can be obtained and the Chilkat River followed up to the Indian village of Klukwan, at the junction of the Klehini.

"The United States Government has already surveyed a line for a wagon road from Haines to Klukwan along the eastern side of the Chilkat, and it is expected that this road will be built within the next two years. The distance from Haines to Klukwan is about 20 miles, and at present the only method of travel, or for the transportation of supplies, is by canoe.

"From Klukwan the Klehini River is followed up to Porcupine City, a distance of 18 miles by a wagon road built by the U. S. Government along the southern bank. Porcupine City formerly supported a couple of hotels and as many stores, but in 1906 the only occupants of the townsite were the employees of a company engaged in placer mining on Porcupine Creek, for whose accommodation the company maintained a store, but the hotels have disappeared.

"From Porcupine the wagon road follows up the river bed for some four or five miles, being only available, in summer, during low water, crossing over to the northern bank, connecting there with a crude wagon road, formerly built by the R. N. W. M. Police, which is followed for a further distance of two miles to old Pleasant Camp, on the Alaska-British Columbia boundary line, and at one time occupied by the Mounted Police.

"The Province of British Columbia is entered at Pleasant Camp, from which point to Rainy Hollow the Provincial Government was last fall engaged in building a trail, or sleigh road, which was, however, not cut through in 1906, so the old trail had to be followed. This follows up the north bank of the Klehini for some three miles to Dalton's Cache. The cache is about 500 feet higher elevation than Porcupine City and is about 1,000 feet above sea level.

"From the cache the trail turns north, away from the river, rising, by a series of zig-zags, in two miles an additional height of 1,000 feet to the level of the plateau, which slopes slightly to the north and is devoid of trees or vegetation. The trail follows across this plateau for some six miles, when it gradually descends into Rainy Hollow. The plateau is said to be very dangerous to cross in autumn, owing to the prevalence of dense fogs, which arise without warning, and in winter on account of blinding snow-storms.

"To avoid this portion of the trail, with its incidental and unnecessary climb, impracticable for even a sleigh-road, the Provincial Government has chosen a line for the new trail following the river valley, and running through wooded country most of the way, which will afford shelter at all seasons, and it also has the advantage of being two or three miles shorter.

"The possibility of improved transportation facilities by the rivers is very slight, as they are only navigable for canoes, while the swift current and the ever-shifting character of the river-bed render any permanent improvement of the channel impracticable. Should sufficient ore be found to justify it, there are no serious engineering difficulties in the way of building a railway from Haines to Rainy Hollow, while Haines offers first-class terminal facilities and a good harbour.

"The Provincial Mineralogist, in the fall of 1906 made an examination of, and a report on, the mineral claims of Rainy Hollow, which is included in the Report of that year." (Note by E. J.—This report is now out of print.) " Since that time little real development work has been done; some prospecting has taken place and many of the claims then in existence having lapsed, have been restaked under other names and ownership. Some new ground has been located but as the old posts have disappeared, it was found to be impracticable how much of ground examined was of recent discovery.

Excerpts from Later Official Reports.

'he gold commissioner for Atlin mining division re-ported for 1908 as follows:

"In Rainy Hollow nothing more than the necessary assessment work to keep the claims in good standing was undertaken by any but the Alaska Iron Company, which has acquired interests in several properties and has been systematically prospecting the same by hand and core drills, and in every instance with most encouraging results. This company has packed (on pack horses) a gasoline and drill plant up to its mine and packed out two tons of ore, which has shipped to the Tyee smelter, and from which the returns were 25.36 per cent. copper and 42.73 oz. of silver. Development work was being prosecuted there this winter and a tunnel was being driven, with the intention of placing ore on the dump for shipment next summer, when the wagon road reaches an available point, but a sudden snowslide having covered up the tunnel, with the men in it, led them to think that, although they escaped in that instance without injury, they might not be so fortunate anoher time, and they decided to close down until they can take proper precautions against, and prepare for all contingencies. Land has been located for a mill-site and other purposes, with a water right on Jarvis Creek. The plant for a concentrator has been stored at Pleasant Camp, to be taken into the company's mine when the wagon road will permit of its being done. Altogether, the company appears determined to develop its prospects.

"Owners of other properties have moved for Crown grants for as many of their claims as they could get surveyed this season, and some are preparing to mine and ship their best-grade ore as soon as the wagon road is sufficiently advanced to enable them to do so. Nearly 30 claims are now being, or have been, Crown-granted.

"Coal has been located about 20 miles eastward from Rainy Hollow, on the old Dalton trail, and pretty well up toward the summit of the Chilkat Pass. It is claimed that the quality is good and the quantity in sight sufficient to warrant the expense of locating and prospecting it."

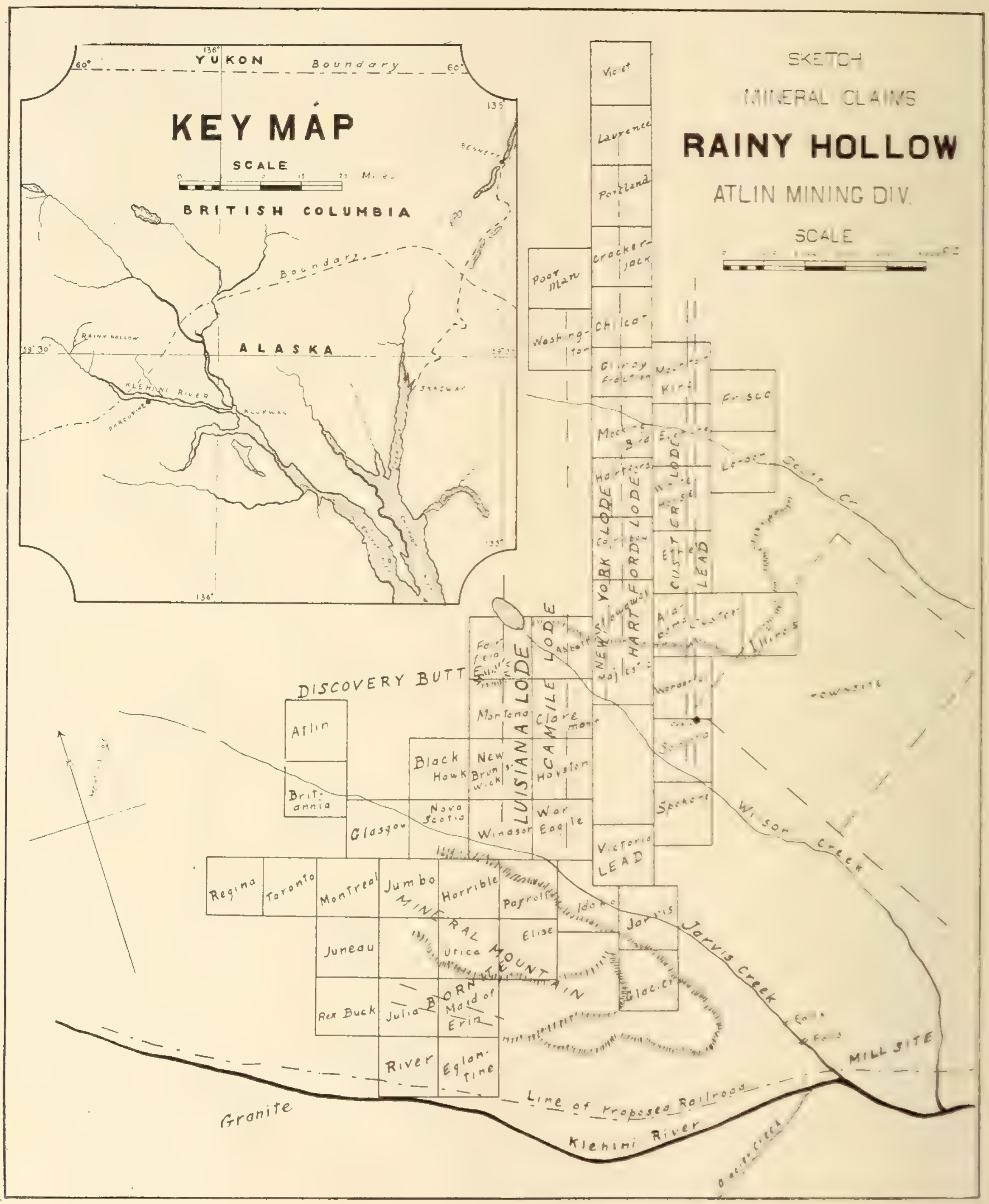
For 1909 the gold commissioner reported:—"In Rainy Hollow section of the district quite a large number of claims are being Crown granted ,but nothing beyond necessary assessment work has been done on other claims, except by the Alaskan Iron Company and Burnham & Kennedy. The wagon road which the Provincial Government has opened from the International Boundary at Pleasant Camp to Jarvis River, although not completed, has made it possible to ship supplies in and ore out by horse-team, and the parties above-mentioned are taking advantage of it to ship some of the bornite ore to the smelters. Burnham & Kennedy, anticipating the construction of the road, prepared for shipment from 100 to 200 tons of choice ore from the Maid of Erin claim during the summer, which will be shipped this winter. The Alaska Iron Company shipped a few tons of high-grade ore during the summer, and this winter there are about ten men engaged on the State of Montana claim, mining and preparing ore for shipment, which will be hauled to Haines (Alaska) by the company's own teams. Some discoveries of the same class of high-grade ore have recently been made about five miles to the east or southeast of the claims above-mentioned, and a number of claims have been located which will demand attention (and a road) in the near future. There was also the discovery of a large ledge of free-milling ore reported on last fall, upon which about a dozen claims have already been located. It is situated in the heart of the Rainy Hollow district, and

Looking Down Valley of Rainy Hollow Chilkat District, Atlin, M.D.

if upon development the value justifies the expectations created by the assay returns from samples submitted, an additional impetus will be given the mining industry in that section."

For 1910 the gold commissioner reported:—"In the Rainy Hollow section development was not prosecuted as actively as was anticipated, but what was done simply increased the confidence of the owners in the value of their respective properties. On the Fairfield

"In my report for 1909, I mentioned the discovery of high-grade ore about five miles to the east or southeast of the principal properties in Rainy Hollow, and that a number of claims had been located thereon. Those were at the base of what is locally known as the Three Guardsmen Mountain, and were so near the International Boundary that the locators were in doubt as to whether some of the properties were in British Columbia or Alaska. All the locations are now found



mineral claim, which adjoins the State of Montana, development work was prosecuted during the summer, by the Alaska Iron Company, with very satisfactory results. On other properties not much more than assessment work was performed.

to be in British Columbia, and development has disclosed deposits of high-grade ore. As soon as railway transportation to tide-water is assured there is encouragement to hope for the establishment of a copper camp at this point, as all those properties, as well as a large

ımber of the older properties to the westward, have ɜen bonded to parties who are promoting the railway ·om Haines to the interior. A few miles to the east f Rainy Hollow a new discovery of coal was reported, nd a number of locations (about 40, I believe) staked n it, but for some reason, unknown to me, they have ot been advertised. The various samples shown and ıe reports of the locators, however, indicate the presnce of coal there in some quantity, and should developıent prove its existence in commercial quantities it ·ill enhance the value of the ore-deposits already menioned as lying a little farther westward."

Excerpts from a description of the country (prepared or the promoters of the railway) already alluded to, re given below:—

For 1911 the gold commissioner reported:—"A large umber of the best claims in this vicinity were bonded n 1910, as mentioned in my report for that year, but I egret to say that the bondees did little or nothing exept upon the Three Guardsmen group, so that a whole ear has been practically lost as far as development is oncerned.

"On the Three Guardsmen group some development vork was done by the option holders, but they all ailed to meet their payments and the bonds have apsed. The confidence of the owners, however, does not ıppear to be at all shaken, as they are developing and procuring Crown grants for their properties as their means will permit.

"I may say that a shipment of about 300 tons of ore (bornite) from the Maid of Erin mineral claim was sent to a coast smelter, from which the returns were more than $100 per ton, but no larger shipments were made from any of the properties.

"No material improvement can be looked for until railway transportation to tide-water shall be provided."

Resources of the First Section Along Railway Route.

There is along the first 30 miles of the railway route a limited quantity of land suitable for agricultural purposes.

The first important resources for traffic are at Klukwan, about one mile from which there is a large deposit of iron ore. It is magnetite, containing more than 50 per cent. metallic iron, and remarkably free from phosphorous, sulphur, and titanic acid.

Across the Chilkat River from Klukwan is situated Salmon River gold mining district, where in several places placer gold mining is carried on. The existence of gold-bearing quartz in this district is also reported. At mile 25 is Wells, at present only a supply station, with a hotel and store for the convenience of settlers in the surrounding country. There the Government wagon road crosses the Chilkat River and runs thence to the Porcupine and Rainy Hollow mining districts. At Porcupine gold mining has been going on for several years and will continue for many years to come. With the advent of the railway, giving reasonable transportation rates for heavy machinery gold mining will be greatly increased by dredging and hydraulic mining operation.

From Wells up, on both sides of the Chilkat and Klehini Rivers, stands one of the best large forests of timber in the north, part of this timber land is in British Columbia.

The foregoing, in a general way, covers the known resources along the first section; they are gold, iron, and timber, with limited agricultural possibilities. However, with the coming of the railway and consequent increase in population and activities, there will be many new discoveries of mineral resources in the districts tributary to this section.

Second Section—The British Columbia and White River Railway.

This section commences at mile 40 from tidewater and proceeds by the Chilkat River for a distance of about five miles, there crosses the river and then goes up through the timber belt on Glave Creek. At mile 51 the main line of the railway comes within two miles of the Three Guardsmen copper lode. This is probably the largest known copper deposit in the North, with a true and well defined vein, or rather mineral zone, from 30 to 150 feet in width. The ores in this deposit are bornite, copper glance, chalcopyrite and sulphite. At one side of the deposit is a large mass of magnetite iron running more than 60 per cent. metallic iron, and the chalcopyrite and sulphite are impregnated with this iron; wherefore, there is under consideration a special treatment of this ore, to separate the copper from the iron and save the iron ore for blast furnace purposes.

From mile 52 there will be a spur about seven miles long to tap the Rainy Hollow mining district. This district has been officially recognized by the British Columbia Government for more than eight years. A number of copper and galena mineral claims have been located there, and sufficient work has been done on many of these to entitle them to Crown grants, which have been issued by the Government. However, up to 1910 this district was not easily accessible, requiring excessive cost for transportation. In 1910 the British Columbia Government finished a wagon road from the Boundary to the foot of the mountains at Rainy Hollow, and development work will be proceeded with under less unfavourable conditions, though transportation of ore from the mines will not be practicable, except by means of a railway. The work that has been done has disclosed the existence of high-grade bornite ores, also galena ores containing as high as 50 per cent. lead. On the Klehini River side there is one ore deposit from which about 50 tons has been mined. The ore runs higher than $100 a ton in silver and copper. Wherever the iron capping has been broken through there is galena ore, containing in some places as high as 30 ounces of silver and 50 per cent. of lead. Everywhere there are great indications of minerals, more than sufficient to supply ample tonnage for a railway.

Near mile 60 lie large coal deposits, which are unexplored. A few hundred pounds was taken from them in the summer of 1910 and packed out on horseback for sampling purposes. This coal proved to be a good grade of lignite, suitable for locomotive and household purposes.

The resources along the line from tidewater to mile 60, as enumerated hereinbefore, include gold, silver, lead, copper, iron, coal, limestone and timber.

Mile 60 is as Isobel Pass, which is the summit of the Chilkat Mountain range, and this summit is attained without a single tunnel or deep rock cut, and in no place does the grade exceed two per cent. From Isobel Pass the route descends gradually to the Alsek River Valley, near Dalton Post. The existence of placer gold in payable quantities has been reported in a number of places between Isobel Pass and Dalton Post, but

owing to difficulty of access to this section, very little work has been done; furthermore, the existence of this gold has been kept secret as much as possible by the prospectors in the hope that they would be able to hold the ground until the provision of railway transportation. One company, believing that the railway will surely be constructed, has this year taken in about $30,000 worth of supplies and machinery for placer gold mining purposes in this vicinity.

From Dalton Post to Lake Kluane the distance is approximately 100 miles, and this is the most important 100 miles along the entire route. This portion of the route runs through the great Shakwak Valley, which is destined to become an important agricultural district. The soil in this valley is rich and fertile, and the climate is favourable to northern farming operations. The Shakwak farmer will find a demand for all his products in the mining towns along the line of the Alaska Midland Railway, at prices considerably in advance of those received by his brother farmer to the South. The farm conditions here are more favourable than those existing in Finland, which is in the same latitude, and Finland has more than 3,000,000 people and exports annually more than $50,000,000 worth of agricultural products. Indeed, from a northern point of view, the condition for agricultural purposes along the route of the British Columbia and White River Railway are ideal. Furthermore, minerals in the form of gold, copper, galena, coal and seepage of coal oil are reported in all directions in the mountains on both sides of this great valley. It is known that placer gold occurs on Sheep, Bullion, Duke, Burwash, Quill, Arch, and a number of other creeks.

One of the largest copper deposits in this section is at Jarvis River. This is a deposit of chalcopyrite, stated to be more than 50 feet in width. It lies within one mile of the railway route, and the ore is reported to be of a character that can be reduced to concentrates containing more than 20 per cent. copper.

North from Lake Kluane, the Alaskan Boundary at the 141st meridian, lies what is believed to be the largest and richest amygdaloid copper district in the North American continent. As a result of the existence of this class of copper ore, placer copper is found in many of the streams in quantities, from small grains to big slabs weighing several thousand pounds. At Kletsan Creek, Jack Dalton, who is one of the pioneers of the North, has located, or acquired, some 25 placer copper claims that he believes contain enormous quantities of free copper.

In the White River district, near Canyon City, there has been a small community of miners for a number of years holding on to copper claims of this character for themselves and their associates. Congress man Sulzer, of New York, is interested in some of these copper claims, and sends a representative in there regularly every year. Inasmuch as the average cost of transportation under existing conditions is about $300 per ton the development work actually accomplished up to the present time is not of an extensive character, and outside of the limited area that has been explored by these pioneers who have been there for the past eight years, the resources of this section of the territory are practically unknown, but if they are to be judged from what is known to exist in the surrounding districts, they must be very rich. (See report of A. H. Brooks, United States Geographical Survey.)

Mineral Mountain—Chilkat M. D., B. C.

The well-known capitalist and mining engineer, Mr Henry Bratnober, wrote as follows concerning this district:—

"If it were not for the difficulty of getting supplies in that country there would be a very great deal of work going on there now, but at the present time very little can be done. If a railway was in there so that

e could get in supplies and machinery, there would be eat activity. I consider this is the greatest copper untry of North America, or any other country that I now of. The copper on White River is metallic cop-r, identical with that of the Lake Superior district, ly more extensive. At the upper canyon of White ver I have seen chunks of native copper lying on the rface weighing more than three tons each, and a eat number of slabs of copper weighing from 300 to 0 pounds apiece. Kletsan Creek is full of copper the gravel, carrying a high percentage of copper, hich indicates that there are veins farther up the eek which have not yet been discovered. There has en very little prospecting done, but I consider this e future copper country of America.

"I am now operating on the Nabesna River, where e ore is bornite, running about 60 to 62 per cent. pper. What I would like to impress upon you is the possibilities of that country, namely, that it will no doubt keep two railways busy, as there will be enough business there for hauling in supplies and hauling out copper to keep two railways going for a long time to come."

Once the railway arrives at White River it will be only a matter of time when it will be decided to construct a branch down the White River to Yukon River and thence to Dawson, as by so doing the present mode of transportation and existence for Dawson will be revolutionized. For example—under existing conditions it requires at least three days to go from Skagway to Dawson and at least five days to go from Dawson to Skagway, while with a branch line connecting Dawson with the British Columbia and White River Railway, one could always go from Haines to Dawson in less than 18 hours, making not only an important saving in time, but also a reduction in cost of transportation.

WHISKEY LAKE AREA

By W. E. H. Carter.*

The Whiskey Lake area, so-called from the presence ithin its boundaries of a fairly large lake of that name, included at the present time within four townships, ich six miles square, and known as Nos. 137, 38, 143 and 144. These are continguous in e form of a square, whose southern bound-y lies two townships north of Shedden and ewis, which border on the north shore of Lake Huron. he lower end of Whiskey Lake is distant about fifteen iles due north of Cutler, on the Canadian Pacific Rail-ay, Sault Branch, from where one may reach the lake y canoe, up the Serpent River waters. The usual oute followed is by a roundabout road 33 miles long

Whiskey Lake

from Massey Station, farther east, northwesterly hrough the Townships of Salter and Tennyson, and ownship No. 130 to the east side of Whiskey Lake, fter which all travel is by canoe through the lakes and ivers which abound in the region. Another road of bout the same length, but in a worse condition for ravel, goes northeast from Spragge, to the west of utler, arriving at Picard's Lake. At this point the anoe is taken, passing up Whiskey Creek, about three niles in length, and thence into Whiskey Lake.

Most of the townships in this district have been under timber license to lumbering firms for thirty-five years or more, with authority to cut the pine and other trees thereon, and the existence of these valuable timber interests has operated to discourage prospecting or mining, which would tend to expose the timber to danger of loss by fire. Most of the townships have been cut over once, a number of years ago, but the timber, then too small to take, has grown in size and in certain portions of the limits is now merchantable. Where the lands have been denuded of their timber this obstacle to mining does not, of course, exist. Since my earlier visit the area has been extensively lumbered so that

Whiskey Lake

over much more of it mining could now be conducted.

The first official examination of this area for the Ontario Government was made by the writer in the spring of 1904 to investigate the reported discoveries of copper bearing veins. Those interested did not then give much consideration to its possibilities in gold or any other valuable metal, and the value of the field remains still to be proved.

The existence of copper in this region was known for a number of years prior to 1904, but not until then

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were other than the original few scattered finds made. Some of these newly discovered veins proved to be unusually unbroken in horizontal extension. A large number of claims were staked out, some of them surveyed and the rest simply applied for pending the opening of the district for mining operations.

The Whiskey Lake country has several characteristic features in which it differs from the lower land to the south, amongst these being the large number of lakes, long and narrow for the most part, separated by high rocky hills and connected one with the other by typical mountain streams. Although the hills do not rise much over 300 feet from the lakes at the foot, they are markedly precipitous and strewn with rock debris. The rocky nature of the country is frequently hidden at a distance by the heavy growth of stout, healthy trees of both hard and soft woods.

For a couple of miles or so north of Massey Station the road passes over quartzites intersected at intervals by dykes of greenstone, probably diorite, and then into a stretch six to ten miles wide composed entirely, as far as could be observed, of the igneous rocks, granite, gneiss, and diorite, the last intersecting the other occasionally in narrow, though more frequently extensive eruptions. At Whiskey Lake the quartzite again appears, and here, as in the belt to the south, it is broken up by a series of more or less parallel intrusions of diorite, having a course east and west and vertical dip. Where observed, the width ranges from 100 feet to as much as half-a-mile. In texture the greenstone is usually medium-grained, granular, and green in colour, although along its contacts with the quartzite this disappears in an alteration towards a darker compact schist.

The quartzite, in texture, composition and colour, varies considerably, but in the main is of rusty white, clear, quartz of medium grain. From this it ranges on the one hand through a pinkish arkose to the fine grained greywacké; and in the other extreme to a coarse matrix of almost clean quartz in which large stones of the same material are included, giving the effect of a conglomerate.

Along the east shore of Whiskey Lake, where the eastern boundary of the four mentioned townships lies, granite outcrops on some of the hills. No discoveries had then been made in this direction.

The vein formations may be separated into several varieties each with distinct features, as will be noticed from the descriptions below, but all appear traceable to faulting or fracturing subsequent to the ejection of the basic eruption.

On Campbell's Island near the centre of Whiskey Lake, and also at the falls, where a stream flows into the north end of the lake, quartz veins outcrop lying well within this greenstone eruptive. The filling is of quartz, of lenticular outline, varying in width from small stringers up to 6 feet and carrying galena and iron and copper pyrites in irregular pockets. These last are quite small and unimportant in themselves.

Samples from each of these veins at the places where uncovered gave by assay only traces in gold, and from \$1.00 to \$3.00 per ton in silver, according to the quantity of galena present. The amount of copper was too small to warrant a determination.

On the west shore of Whiskey Lake, on mining location W. R. 94, and at a point about southwest from Campbell's Island, a vein of quartz is exposed back from the water's edge a short distance and lies well within the coarse quartzite rocks. Quartz and chalcopyrite compose the vein material. Of this, from the exposure on the shore, a small amount was raised by open

Whiskey Lake

Whiskey Lake

pit which ran high in copper content. In a 25-foot shaft sunk a short distance back from the lake the quartz body breaks up into a few smaller stringers with less copper. The small amount of work done with the meagre surface exposure is insufficient to give any idea as to the continuity of either the vein or the copper values therein.

The veins which have, however, been found more frequently than any of the others consist of quartz and chalcopyrite, filling faults or shattered zones of the greenstone, always either in or quite close to its contact with the quartzite. From their unusual continuity along unvarying lines of strike, and the content of fair quantities of copper pyrites, it would appear that they constitute the most important copper bearing deposits in the area. The greenstone alongside of these contacts evidently marks the main lines of weakness in the rocks in the locality, since no other fissures approach the prominence of these.

Where a clean fault was made the vein has all the characteristics of a true fissure deposit. The walls are often slickensided and lined with more or less gouge, being in such case well defined. Most of the gangue consists of quartz, especially where the vein has narrowed

ɔwn, the only other rock being trap, which is interɪnded through the quartz in greatest quantity where e vein is widest. The brecciated ore bodies, which fol-w lines or zones of fracture rather than of faulting in ıe diorite, are composed mainly of the trap itself in ɪgular masses, both large and small, cemented toether with a much smaller quantity of quartz and chalɔpyrite. The walls in this case are rather indefinite.

The strike of these veins, like that of the contacts ıey follow, is most often a few (about ten) degrees ɔuth of west, but it varies locally as much as 45 derees. They have a width of from three or four feet ɔ over twenty feet. The copper occurs as chalcopyite, and constitutes practically the only sulphide presnt, iron pyrites being visible only in the inclusions of iorite and in the walls. The chalcopyrite is both finely isseminated and in large masses or bands, sometimes foot wide. As very little work has been done, it was ɪot possible to fairly sample the veins for their copper ontent; but it will be neither too much nor too little to ay that they are very good prospects.

One of these veins is especially interesting. It was liscovered and located by Mr. H. E. Long, who has ince traced it for nearly three miles, and for a further listance of two or three miles more on either side he found similar outcroppings of apparently the same deposit. The locations covering it for about half their total length border on and include most of the land under the waters of McCool and Corner lakes. The property is known as the Long Tom, and aggregates about 1,760 acres. The fissure follows an almost straight course S. 80 W.

Whether or no any portion of this vein carries gold had not at the time of my examination been determined. The area is new and almost unknown so that one can hardly express an opinion in the matter. Certainly no gold of any account has been met with up to the time of this former examination.

Still another kind of copper bearing vein occurs, near the shore of Whiskey lake at its northwest end. The vein has the same strike as that of the Long Tom. One opening showed a width of 20 feet, which seemed to be maintained over its uncovered length of 300 feet. It traverses the greenstone formation, the nearest quartzite lying a short distance to the south. The composition is of quartz and slightly altered greenstone closely intermixed into a dark mass through all of which chalcopyrite is disseminated, mainly in a fine state and in fair quantity where exposed, probably around 2 or 3 per. cent.

There were a number of other veins staked more or less similar to some of those described and in various parts of the area. Some also had previously been discovered a few miles farther south and this last may indicate a possibility of more veins being found over a considerably larger area than this immediate vicinity of Whiskey lake.

THE FACTOR OF SAFETY IN MINE ELECTRICAL INSTALLATIONS*

By H. H. Clark.

Introduction.

This paper is not written for the purpose of discouraging the use of electricity in mines. The advantages that have in the past attended the use of electricity in mining work will be even more apparent in the future as operations are extended, power systems consolidated, and generating stations centralized. A discussion of these advantages is unnecessary since they are well known to everyone interested in the subject. The purposes of this paper is to urge that the requirements of safety, as well as those of efficiency, be considered in the installation and operation of electrical mining equipment. The Bureau of Mines publishes this report as one of a series dealing with the use of electricity and the prevention of electrical accidents in mines.

A factor of safety may be regarded as representing the ratio of maximum capacity to average duty. Factors of safety are used in the solution of engineering problems in which the conditions can not be exactly determined in advance, or in which unforeseen happenings may arise to introduce severe stresses. Especially does this apply to problems in which the safeguarding of human life is a consideration.

The use of a factor of safety is not a sign of poor engineering, but quite the contrary. Good engineering is based upon recognizing conditions, not upon ignoring them. The wise engineer prepares for emergencies instead of assuming that the emergencies will not arise. A factor of safety is good insurance, which is everywhere recognized as a business necessity.

The safe operation of electrical mining equipment is an engineering problem that involves the element of human life and that is influenced by conditions and events that can not always be foreseen. The successful solution of the problem will, therefore, depend largely upon the factor of safety that is considered in the selection, installation, and maintenance of such equipment.

In problems in which the factor of safety can be expressed numerically it is seldom made less than three, and often more than 30. In the present discussion the factor of safety can not be numerically expressed because neither the capacity for safety nor the duty to be performed in preventing accidents can be measured in the same terms, or even in any terms at all. Therefore, more care, better judgment, and more liberal allowances in design, construction, and installation are required to insure a factor of safety than would be required if its existence were susceptible of mathematical proof. But above all, the absence of a mathematical basis for argument demands great courage of conviction on the part of those advocating increased expenditures in the interest of safety.

To facilitate consideration, the problem may be divided into two principal parts: First, an analysis of the conditions to be met; second, a discussion of how to meet them and insure a desirable factor of safety.

*Technical Paper No. 19, U. S. Bureau of Mines.

Classification of Accidents Due to Electricity.

In analyzing the relation that the use of electricity in mines bears to the accidents that occur there, the first step is to classify the different ways in which electricity can cause injury, death or disaster.

One characteristic of the electric current with which everybody is familiar is its ability to produce electric shocks. The conditions underground are favourable to their occurrence. There is a well-known fire risk in connection with the use of electrical apparatus. The use of electricity in the vicinity of gas, explosive dust, or explosives, all of which may be found in mines, is attended with danger. There are, therefore, in connection with the use of electricity in mining work three possible dangers—shocks, fires, and explosions.

Electric Shocks.

The conditions under which electricity can start a fire or cause an explosion may be absent from a mine at any or all times, but the chance of receiving an electric shock is always present in any mine where electricity is used and men are at work.

Many conditions that are peculiarly favourable to the occurrence of electric shocks are found in mines. Most of these, such as dampness, dust, limited space, and scanty light, are unavoidably associated with mining work. In addition, many underground employees are unfamiliar with electrical apparatus and the proper way to regard it. They may have no responsibility as to its operation or condition, nor any direct interest in it whatever. To some of them electricity may be not even a name or at most only something about which conflicting and confusing statements are made. Yet though the conditions underground favour electric shocks and though the men may be unfamiliar with electricity, trolley wires and uninsulated feeders are frequently found operating at 250 and 550 volts, the earth being used almost universally as the common return for all direct-current apparatus.

Danger from Ground-Return Circuits.

Under the best of conditions ground-return circuits offer more chances for shock than do completely insulated circuits. The risk is increased where workmen are obliged to stand upon the ground when handling apparatus operating with ground returns. In ground-return systems one side of the generator is connected to the earth, to the track-rail network, and to the return feeders which are in parallel with both. As a result anyone who stands upon the ground stands upon one side of the electric circuit and only a single contact with the other side of the circuit is necessary to give a shock.

Dangers from Trolley Wires or Bare Conductors.

Trolley wires in mines present a most fruitful source of electric shock. Trolley wires are necessarily bare conductors; they may extend for long distances through out a mine, and often they must be installed less than a man's height above the track rail which is used as part of the return circuit. A low trolley wire is especially dangerous in places where men must work in making up trips of cars, as at partings where loaded trips are brought out to the foot of a rope-haulage system. Under such circumstances both the loaded and the empty trips are in the parting at the same time, and manipulation is required to make up the loaded trip to be taken out on the rope and to split up the empty trip to be taken in by the various locomotives. It is often desirable to do this work rapidly, and if the trolley wires are lower than a man's head the chance for shock is considerable. Even if the men are familiar with the conditions their attention, while hurrying to get the trips away from the parting, can not be constantly on the trolley wire.

Trolley-wire feeders and the wires of circuits that operate motors of any description, if exposed to the same extent, offer the same chance of shock as does the trolley wire. Usually such exposure is not necessary, however, as the wires can be strung along the sides of entries in positions less accessible to persons passing. It is also possible to insulate or protest the wires.

Danger from Accidental Charging of Equipment.

Apparatus that has accidentally come in contact with the ungrounded side of an electric circuit is almost as dangerous as the trolley wire. If such apparatus is metallic and is insulated from the earth it offers all the necessary conditions for giving a severe shock, and the danger from such a shock is accentuated by the fact that the victim, being unaware of his proximity to danger, may firmly grasp the charged part. If a shock is received while the victim is grasping the source of current, the results are more likely to be severe than under other conditions, because the grasp is "frozen" in place by the sudden contraction of the muscles, and voluntary release from contact with the circuit is impossible. By connecting to the earth such parts of apparatus as are made of conducting material but are not designed to carry current they can not become charged with electricity to a potential above that of the earth; consequently a shock can not be obtained by a person's establishing contact between such parts and the ground.

Shocks from Locomotives and Cars.

There are certain ways in which shocks can be received from locomotives and mine cars. The frames of locomotives are connected to the current-carrying parts of the motors and become charged whenever the motors or headlights are in operation. If the locomotive loses its ground or contact with the rail by reason of oversanding or for any other cause, the full line potential exists between the frame of the locomotive and the rail. Under such circumstances as severe a shock can be obtained from the locomotive frame as from the trolley wire.

Since the drawbars of the mine cars are connected to the locomotive frame and are continuous throughout the length of the trip, it follows that, whenever the locomotive loses its contact with the rail, all the drawbars are raised to the potential of the trolley wire unless some of them are in contact with the car axles, axle boxes, or some of their connections.

Relative Danger from Different Voltages.

An electric shock is caused by the passage of current through the human body, the severity of the shock depending upon the amount of current passed. The amount of current depends upon the voltage and the resistance of the circuit, the latter including the resistance of the body, the resistance of its contact with the source of current, and any resistance that may be in series with the body, such as ground resistance

viously, therefore, all other factors being equal, the verity of the shock varies with the voltage causing There are voltages so small that they are not caple of passing through the body current sufficient to oduce a shock. As these voltages are exceeded, a lue is reached at which shocks begin to be felt. As e voltage is further increased a value is reached such at shocks may be fatal if the contact is maintained r a sufficiently long time. At still higher voltages e period of contact necessary to cause death becomes orter.

The effect of any shock depends so much upon the rticular conditions involved that no specific values of ltage can be assigned to any of the conditions menoned. The physical makeup of a man greatly affects e outcome. Some men seem practically immune from ocks from potentials as high as 500 volts, while others ay be killed by a much lower voltage.

As regards the relative danger of a current having potential of 250 volts and one having a potential of 0 volts, both have been known to cause fatal shocks. ompared with a 250-volt potential, a 550-volt potential t only passes more current through a man's body der a given set of conditions, but it is also more kely to break through insulation to ground. The gher voltage will pass the same current through orer contacts and greater resistances than will the wer.

Fires Caused by Electricity.

The danger from fires caused by electricity arises rincipally from defective installation, careless upkeep, from injuries to equipment resulting from falls of of or similar causes. A short circuit or a ground at does not blow the circuit breaker nor the fuses ay produce heat enough to start a fire by leaking ross coal or timbering. The blowing of an open fuse accompanied by sufficient heat to ignite combustible aterial that is very close to the fuse, especially if for ny reason the arc is long drawn out. The presence f inflammable material around electric motors or startng boxes may prove to be a source of trouble. Incanescent lamps produce heat enough to ignite combusble materials if the dissipation of heat from the bulbs f the lamps is allowed to become restricted. With onductors bare and with both sides of the circuit trung side by side there is a chance that leakage from ne side to the other across coal or damp timbering rcing, and heating enough to start fires.

The conductivity of coal, especially dry coal, is usully very low. This fact tempts careless workmen to oor construction and poor installation; also it aids in overing up these defects. Such poor work might be ogically expected were it not for the fact that, under ome conditions, grounds to coal will produce sparking, rching, and heating enough to start fires.

Inflammable material should never be allowed to ollect about a motor or in the vicinity of fuses or other pparatus that can produce arcs, flashes, or considerble heat.

To provide a factor of safety, starting boxes, fuses nd all apparatus that may throw off sparks under ormal conditions, or that are subject to abnormal onditions that result in the production of even greater eat, should be mounted on or protected by a sheet of netal or other strong non-conbustible material.

Explosions Caused by Electricity.

Explosions may be caused by the ignition of explosives, gas, or coal dust.

Ignition of Explosives.

Accidents due to the ignition of explosives by electricity may be divided into two classes: Those that occur while handling and transporting explosives near electric circuits and those that are incident to the detonation of explosives by electrical means.

As to accidents of the first class (with a single exception noted below), electricity is no more of a menace than any other source of flame and heat, but it is as great a menace and should be treated accordingly. As much care should be used in handling explosives in the vicinity of electrical apparatus as though the flashes and sparks that it is capable of giving were constantly in evidence.

Any source of heat may attack an explosive from the outside, but electricity may, under certain conditions, do more than that. An explosive that is a conductor of electricity may come in contact with an electric circuit in such a way that current may be passed through the explosive itself, and although no spark may occur outside the package, ignition may take place on the inside. The possibility of such an occurrence may seem to be extremely remote, but accidents have been reported for which no other cause could be assigned and in which the existence of the above conditions was quite probable. As mentioned in a foregoing paragraph, it is possible, when mine cars of a certain type are used, that a considerable difference of potential may exist between the drawbars and those metallic parts of the car that are in electrical connection with the track rail. If such a care were loaded with metallic packages of explosives, the points of different potential might be so joined that current would flow through the packages and possibly through the explosive itself.

Accidents Due to Electrical Shot Firing.

The accidents that occur in connection with electrical shot firing are due, for the most part, to the accidental discharge of detonators in the vicinity of explosives or to the premature ignition of shots after holes are charged. With regard to the accidental discharge of detonators in the vicinity of explosives, a cardinal principle of safety is that detonators should be kept separate from explosives and that batteries and other sources of electric energy should be kept separate from detonators.

With regard to the premature ignition of shots, it is not the best practice to shoot electrically under conditions that require one side of the detonating circuit to be connected to the earth, because whenever grounded systems of distribution are used, unexpected differences of potential exist in the earth in the vicinity of such circuits. If, therefore, one side of the detonator be purposely grounded, an accidental ground on the other side may connect the detonator across a potential sufficient to cause ignition. Premature ignitions have been reported which seemingly have been caused by the conditions just described.

Ignition of Gas.

Electric sparks will ignite mine gas and air mixtures that contain between 5 and 11 per cent. of gas

(methane). Between these limits a comparatively small spark is sufficient to fire the gaseous mixture. The size of arc or spark that will occur when an electric circuit is opened depends upon a number of things, such as the voltage of the circuit, the amount of current broken, the speed of break, and the character of the circuit. The determination of the exact influence of each of these factors is an interesting problem. For all practicable purposes, however, it is safest to assume that all sparks which occur around such apparatus and circuits as are used for power and light in a mine are capable of igniting gas. Although this assumption may not be correct at all times, the continually varying conditions surrounding such equipment make a contrary assumption unsafe. For instance, a motor that is so well designed and so adapted to its load that the commutating sparks are too minute to ignite gas may, in starting, develop dangerous sparks.

The ignition of gas by electric incandescent lamps is now being investigated by the Bureau of Mines. A large number of lamps of various sizes are being broken in different ways while surrounded by a highly explosive mixture of gas and air. The results so far obtained show that certain sizes of lamps when broken in the presence of gas will ignite it, and that in the action of the lamps there is a difference which depends upon the size of the filament, the larger filaments being more likely to ignite gas than the smaller ones.

Ignition of Coal Dust.

The study of the ignition of coal dust by electric arcs and electric flashes has been undertaken to some extent by investigators in Europe. The results of their experiments indicate that electric flashes can ignite coal dust suspended in the atmosphere. The Bureau of Mines is now devising apparatus preparatory to making an extensive investigation of this subject.

Conditions Surrounding Electrical Installations in Mines.

The conditions surrounding electrical apparatus in mines are more severe and less constant than those surrounding similar installations above ground; there are more trouble-causing factors than are found upon the surface.

Physical Conditions.

Falls of roof sufficient to wreck trolley lines and feeder systems are not uncommon. Dampness, dust, and acid water in sufficient quantities to be detrimental to insulation are present in many mines. Some or all of these conditions must usually be considered in selecting mine electrical equipment. Apparatus that might operate satisfactorily in the absence of these elements will fail when they are present.

The space available for installing and operating underground electrical equipment is usually limited, thus increasing the chance for accidental contact with the live part of the system.

Another factor that has more influence than is usually recognized is the lack of light. Not only has this condition a direct bearing upon accidental contact with electrical apparatus, but it also has an undesirable indirect influence because of the difficulties which it places in the way of properly installing and inspecting the equipment.

Temporary Character of Installations.

As compared with electrical installations on the surface those underground are temporary in character. Circuits and machines are put in place with the certain knowledge that sooner or later they must be removed and installed elsewhere. This fact undoubtedly has an undesirable influence upon the quality of work performed. For economic reasons it is not practicable to resort to methods of installation that would be followed if the work were to be permanent. The men who direct the work must have peculiarly good judgment and must be keenly alive to all the requirements of the situation if a suitable factor of safety and a desirable low installation cost are to be maintained. Although elaborate methods of installation may in time pay for themselves in low cost of maintenance, such methods are not economical if the equipment is to be moved frequently. Obviously, an installation investment in excess of the amount necessary for satisfactory operation during the period of service is an entire loss. If the period of service is to be short, there is a natural tendency to limit the cost of installation. Whether such curtailment is wise depends so largely upon circumstances that no general statement can be made. However, undue reduction in installation expenditures not only reduces the factor of safety at one point, but also lowers the general standard of workmanship throughout the mine. If no accident occurs as the result of poor or cheap work, it is natural to assume that the work met the requirements. The fallacy of making a general application of results obtained in a single instance is manifest at a glance. Yet arguments of this kind have undoubtedly been used in the past to justify inferior work.

The Prevention of Accidents Caused by Electricity.

The problem of safeguarding electrical mine equipment is not a simple one. There is no general formula or equation for its solution. Moreover, there are so many variables involved, so many factors that cannot be exactly related, so many possible coincidences, that results can not be predicted with mathematical exactness. It is necessary to consider each part of the problem by itself, in the light of local conditions, and to adopt such measures as insure a large factor of safety.

Elimination of Contributory Causes.

A logical first step would be to remove or to counteract as many unfavourable conditions as may be disposed of thus.

As previously stated, scanty light, limited space, and the presence of dust and dampness are underground conditions that are favourable to the occurrence of electrical accidents. The influence of the first of these may be eliminated by providing lights at particularly dangerous places, such as partings and crossovers. If electric wires are a source of danger at such places they can be made a source of light also.

Although it may be impracticable to eliminate entirely the effect of limited space, this condition may be counteracted by the erection of guards about apparatus.

Dust and dampness are elements that can hardly be separated from the operation of a mine; in fact, the presence of dampness is often desirable to offset the effect of dust. It is possible, however, to provide

aparatus so designed and installed as to resist the a ion of dust and dampness, and the more generous t factor of safety included in such design and install ion the greater will be the resistance.

Confinement of the Current.

The problem of safeguarding may be divested of ime of its vagueness and put in concrete form by conlering that if the electric current can be kept where belongs—in the conductors designed to carry it—it nnot give shocks, set fires, or ignite gas, dust, or exosives. Electricity becomes actively dangerous only hen it breaks away from its proper channels in stray rrents or as sparks and arcs.

As far as stray currents are concerned the confineent of electricity in its proper place is primarily a iestion of insulation, a term that includes the coverg of conductors, the insulators upon which they are ipported, and the insulating material used in motors id accessory equipment. Against insulating covergs for conductors is brought the argument that such overings deteriorate rapidly and are an added element f danger because they give false impressions of safety. he truth of this argument depends upon the kind of isulation and the conditions of service, and cannot be garded as universally applicable. If bare conductors re used they must be well installed and, to some xtent at least, guarded, in order to confine the current. Vith the possible exception of high-voltage cables all onductors, bare or insulated, should be supported pon insulators that are mechanically strong as well s electrically efficient. If bare conductors are used, onfinement of the current depends entirely upon the nsulators. Moreover, dampness and dust can come nto direct contact with the wire, a condition not conistent with the highest factor of safety.

In order to insure a high factor of safety in the insuation of motors and other electrical machines they nust be carefully selected with a view to the service which they are to perform. They must then be protected from moisture and dust unless such protection is inherent in their design. Care in this respect will be rewarded not only by increased safety, but also by decreased cost of upkeep. The maintenance cost of inclosed motors operated in damp and dusty places should be less than for open motors operated under the same conditions if both types of machines are properly designed, constructed, and rated.

It must be admitted that the electric current can not be kept where it belongs in the sense of eliminating entirely such sparks and arcs as occur at fuses, circuit breakers, air-break switches, starting rheostats, and the commutators of direct-current machines. In this connection the factor of safety must be applied by arranging to confine the outbursts of current to a limited area unoccupied by anything which may be affected by heat or fire.

Additional Precautions.

Assuming that in the selection and installation of electric equipment care has been exercised to insure the proper confinement of the current, the factor of safety may be increased by grounding the dead metallic parts of apparatus, by providing means for insulating the bodies of those who work upon such apparatus, and by barring from the vicinity of the current such elements as are explosive or combustible.

Maintenance of Safety Factor.

It is as important to maintain a high factor of safety as to obtai nit in the first place, and this requisite call for careful and frequent inspection by the mine electrician, whose responsibilities can scarcely be overrated. The supervision of the electrical equipment of a mine is a task that requires unusual ability, sound judgment and experience of a peculiar sort. To select suitable apparatus, to install it properly and economically, and to maintain it free from interruption of service at a minimum cost demands much ability. When the requirements of safety are added to the list of duties the responsibility is not lessened. The establishment and maintenance of a high factor of safety rests as much with the man who has direct charge of the electrical equipment as with anyone. It seems reasonable also to assume that a man who is competent to maintain a high factor of safety is no less able to maintan as low a cost of maintenance as is consistent with satisfactory operation.

Summary.

By way of a summary there follow five terse suggestions for reducing the number of accidents due to the use of electricity in mines:

1. Remove contributory causes.
2. Remove from the vicinity of electrical apparatus all elements susceptible to its influence (gas, dust, explosives, combustible material, etc.).
3. Keep the electric current where it belongs.
4. If under certain circumstances the current can not be entirely confined, at least limit the area of its activity by using protective devices.
5. Insure a high factor of safety by: (a) Selecting materials and apparatus with care; (b) installing equipment in a strictly first-class manner; (c) inspecting equipment frequently and thoroughly; (d) maintaining it in good condition at all times.

BOOK REVIEW

The Examination of Prospects—A Mining Geology— By C. Godfrey Gunther, E.M.—222 Pages—Soft cover—Price $2.00—McGraw-Hill Book Company—New York—1912.

At last a serious gap is filled. The theory and practice of mining have been fully exploited. The geology of ore deposits has been discussed by scores of writers, and the results of discussion and investigation have been given to the public in various forms. But the problem of reporting upon undeveloped prospects has heretofore received but scant attention.

Writing from the point of view of the prospector in the United States, Mr. Gunther states that the demand for good properties greatly exceeds the supply. No

one will dispute this. Also, no one will dispute the statement that money and energy are wasted over properties that should never be touched. While those in search of promising properties no longer expect to find large proven ore bodies, yet to justify even preliminary outlay there must be definite indications of an ore-shoot, if not a clearly certain amount of blocked-out ore.

Preliminary examinations and work should be of such a character as either to condemn any given property or to determine rightly its immediate possibilities. Hasty topographical and geological surveys and a few assays of outcrops may mean little or nothing, or may be totally misleading. It is essential that all other factors that influence the life of a mine be considered. While, in many cases, a cursory examination only is required to throw a property out of court, yet more than this is needed before a mining claim can justly be condemned. And when work is to be continued, a thoroughly detailed study of the situation is a prerequisite. Moreover, this study should be continued as operations progress. This is, in fact, the text of Mr. Gunther's book.

The book opens with a chapter entitled Mining Examinations. After touching on formal and preliminary examinations of mines, examinations for the rescue of badly expended capital, examinations of prospects, etc., the author takes up the price and terms of sale. These last, he asserts, are too often given but small consideration. "Sales of undeveloped properties are made at prices that largely discount even a decidedly favourable outcome for the proposed development."

Again, "owners generally suffer from extreme optimism, and many engineers from excessive professional timidity, and neither is willing to meet the other half way. Owners of prospects are usually brought to their senses after repeated unfavourable examinations, but many engineers more make a favourable report because of the risk of personal reputation." By a curious obliquity of human nature, the quality of "timidity" referred to by Mr. Gunther is labelled "conservatism" by the profession, and is often mistaken for an indication of sound judgment.

Mr. Gunther points out that no engineer should expect to find a mine having ore of a greater net value than the purchase price asked, unless the mine is "admittedly bottomed and has no possibilities beyond the ore already developed." We agree with the author that this is a rare case. Some such rule as that enunciated by Mr. J. H. Curle, to the effect that 66 per cent. of the purchase price should be represented in net value of ore reserves, with the lower levels still looking well. Even on this basis, most prices are set too high.

"Cash payments," continues Mr. Gunther, "should not be made on prospects." This may or may not be good advice. In a rush district cash payments are often essential as a token of good faith and financial responsibility on the part of the purchaser. But in all cases, first expenditures should be reduced to a minimum, and the whole object should be to follow the ore. The expedient suggested by Mr. Gunther of a monthly "salary" payment to the owner is not to be commended.

In the course of Chapter I., Mr. Gunther develops the theme of preliminary examination and touches particularly on the equipment for, and the work of, sampling. He recommends personal re-sampling as a check upon work done by assistants. The "foot-ounce" method is suggested as that best adapted for calculating ore reserves. "In this method the length of each sample is multiplied by its assay value; the products from all the samples in the block under consideration are added, and this total divided by the sum of the lengths, the quotient being the average value." With paragraphs upon such considerations as stoping width, hand-picking, metallurgical losses, etc., the chapter closes.

Chapter II. has for its subject "Structural Geology." Then come chapters on the structural features of ore deposits (this is a particularly strong chapter); primary ores and their distribution, types of primary ore-deposits, primary ore-shoots, primary alteration of wall rocks, alteration by surface agencies, residual ores, secondary ores and ore-shoots, and, lastly, outcrops.

The last chapter, "Outcrops," deserves more than passing notice. Mr. Gunther here discusses fully the relation between outcrop and vein. He points out that strong, persistent outcrops of uniform width indicate the probable size and character of the underlying vein, "whose persistency in depth is likely to be proportional to the length of its outcrop." Fissures, traceable for long distances, are commonly found to possess at least equal depth. Short, irregular outcrops indicate irregular underlying deposits. "Outcrops that comprise a series of large, irregular masses, perhaps connected by narrower veins, are in general likely to become smaller in depth." These generalizations, while open to incidental exceptions, are true in the light of experience.

The mechanical effect of erosion, the topographic expression of mineralization, the porosity of outcrops, "casts" in resistent gangue minerals, and other common phenomena, oftener than not overlooked by the prospector, and the engineer, are given careful presentation in this chapter. For instance, the fact that small percentages of copper, contained in iron pyrite as chalcopyrite, interrupt and modify the crystallization of the iron pyrite. In the case of galena, the crystallization is marked when considerable quantities of silver are present. Thus, careful scrutiny of the mineralogical features of an outcrop may lead to very important conclusions. Microscopical examination, also, may play a strong part.

Mr. Gunther's book fills the traditional "long-felt need." It helps to make complete the list of guides to the varied branches of the profession of mining engineering. Like all proper books of the kind, it emphasizes explicitly and implicitly the fundamental business aspects of prospecting and mining.

"Examination of Prospects" is well bound, clearly printed, adequately illustrated, and creditably edited.

PETROLOGICAL DEPARTMENT

By G. S. Scott.

R. A. B.—This rock was received by the Petrological Department for determination of its value as road metal.

The specimen submitted is a dark green mottled rock which is exceedingly tough under the hammer. It has a very obscure schistosity but no cleavage what-

er. Many small glistening cleavage planes of a dark mineral and a few grains of pyrite can be seen. The specific gravity was shown by several determinations to be near 3.02. The porosity was found to be only several one-hundredths of one per cent. It is, accordingly, a negligible factor in the use of the rock for road metal.

These few facts were all that could be learned from mere inspection of the specimen. To supplement them, a thin transparent section of the rock was prepared and examined under the microscope. This examination showed the rock to be an epidote amphibolite, a member of the family to which gneisses and schists belong. It consists chiefly of hornblende crystals felted and woven together with interspersed grains of feldspar, epidote and ilmenite.

This rock meets the different requirements of material for road metal quite completely. These requirements are: 1. High specific gravity; 2. Low porosity; 3. Toughness together with the quality of yielding to the crusher without the production of too much fine material; 4. Resistance to weathering. With regard to the last point, there is no danger of a rock of this kind crumbling upon exposure to the weather after quarrying, as many trap rocks do. Another advantageous feature is the titaniferous composition of the iron ore, for such iron ore is not nearly so susceptible to weathering as the more common magnetite. The comparatively high content of iron ore makes the rock an unusually heavy one even for a rock of its kind.

This epidote amphibolite was produced by the metamorphism of a gabbro or coarse diabase deep within the earth's crust. It is remarkable that if this alteration had proceeded either farther, or not so far, the resulting product would not have been so suitable for use as road metal, as it is. In the former case it would have become more granular, like a gneiss, and in the latter case the porosity would have been left too great and the cohesive felted structure would not have been developed.

Prospector, Porcupine—Sericite Schist.—This is an extremely fine-grained soft fissile rock of light silvery-grey colour and greasy feel. With hydrochloric acid it effervesces briskly at all points.

The thin section shows an aggregate of clear colourless grains with calcite, much sericite and pale chlorite. The colourless grains, though unstriated, are in all probability feldspar. Opaque streaks that are yellow in reflected light are seen with a high power to consist of hosts of minute brown rutile crystals. Several large striated feldspars of irregular shape are also present. The chlorite sericite and opaque streaks form a beautiful schistose structure, the bands of which bend about these large feldspars.

There seems no reason to doubt the derivation of this rock from a diabase, gabbro or basalt. It is probable that it is from a part of a mass of such rock that suffered extreme mashing. It is not likely that the whole of the mass would have been so crushed.

The original ilmenite is now represented by streaks of leucoxene, composed largely of rutile. The alteration of ilmenite to rutile is a common effect of weathering; but, as it is known to be produced by metamorphism also, there is no reason to assume that the rock was subjected to weathering before being crushed and recrystalized under metamorphic conditions. The large feldspar fragments are relics of the original feldspar that escaped crushing. They are remarkably fresh. A few grains of pyrite in the form of sharp cubes are present.

PEAT PRODUCTION

In European countries, where labour is cheap, peat fuel has been produced for many years. In Canada, where labour is expensive, development of the peat industry has been retarded on account of the cost of production.

The history of the many attempts made on the continent of America to produce peat fuel indicates "failure after failure." But persistent effort was bound ultimately to meet with its reward; experience taught that hand labour must be replaced by machinery and that natural instead of artificial methods of drying were preferable. The result is that to-day peat fuel is produced commercially, and although improvements must and will be made, still the methods now employed give a product that will compare favourably with the best coals on the market, and if taken on a B.T.U. test might be found to beat some of them.

Before any machinery is installed on a bog the land must first be thoroughly surveyed and tested. To ensure success a competent peat engineer should be employed, who will lay out the bog for proper working. A system of ditching must be devised to provide for partial drainage. A new bog will hold about 95 per cent. water, which volume should be reduced to say 85 per cent., as this amount of moisture seems to have the best effect on the peat in process of manufacture.

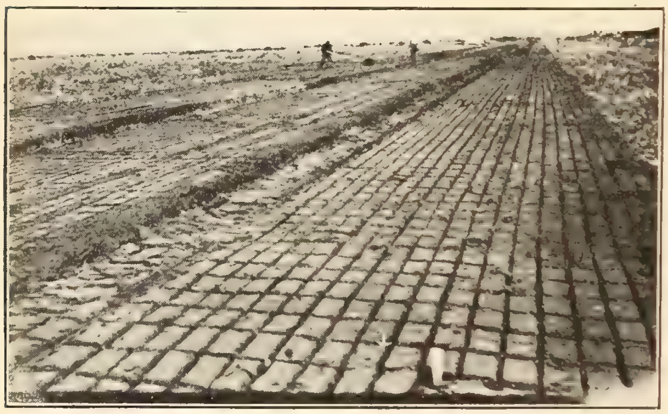
The machinery used for the excavation, and maceration, to give the best results, must be both light and strong. The most modern is a self-propelling machine, or system of machines, mounted on a large platform, which in turn is mounted on a tractor of the caterpillar type. On the forward end is placed a gasoline engine, of anywhere from 50 to 75 h.p. to furnish power for the propelling of the machine, for the excavator, the macerator, the cable for the cars, and the drawing of the field press.

On the rear end is placed the excavator boom, on which are mounted bottomless buckets. As the machine advances the excavator digs out a trench behind, and being mounted on a pivot it has a sweep of about twenty feet. The object of the "bottomless" buckets, is to overcome the natural stickiness of the peat and aids greatly in the evacuation. The buckets, operating on the underside, scrape up the face of the cut, thereby ensuring the mixing of the several layers of peat. Each layer has a different fuel value, and by the mixing is secured a product of uniform quality. From the ground surface to the upper end of the boom extends an apron under the buckets, which keeps the contents in place as they travel. When the buckets reach a certain point they empty the raw peat on to a belt conveyor, which carries it to the macerator. The use of

this machine is responsible for the difference between the smoky, quickly consumed fuel of other days, and the modern product of peat. It was invented by the late Aleph Anrep, a Swede, who gave his whole life to the study of peat, and through whose energy and inventiveness Sweden owes her place to-day as first among peat-utilizing countries.

Peat is of cellular formation. The cells hold moisture which they give up most reluctantly; after drying they re-absorb moisture, and consequently without special treatment the fuel can never be drier than the surrounding atmosphere. Tht Anrep macerator, through the medium of a series of rapidly revolving knives, cuts and tears the fibre, destroys the cells and reduce the whole to a pulpy mass of even texture. After being macerated the peat is ejected into a spiral conveyor, which carries it to dump cars for transportation to the drying field. On each side of the working trench the ground has been cleared; in the case of a trench, say twenty feet wide and ten deep, four hundred to four hundred and fifty feet wide and running the whole length of the trench.

The dump cars carrying the prepared peat run on a loop 24-inch gauge railway. The rails are mounted on steel ties and quite easily handled—an essential fea-



A Prepared Peat Bog

ture—as this loop has to be moved from time to time, a sthe machine advances. The power is derived from an endless cable passing over drums on the machine. When a car is filled it is clamped to the cable and starts on its journey to the field press. When it reaches this point, it is uncoupled and the contents thrown into the press, which is merely a heavy frame of say eight feet wide and fifteen long. The rear end is raised about five inches above the surface of the ground. It works from the outer margin of the drying field towards the machine, being drawn by a cable attached to the forward end and passing through a sheave anchored at the point where the row of peat is to be, from thence it passes around a revolving drum on the machine, to a winder operated by a boy, which takes up the slack as it is advanced. Just forward of the rear end of the press, is a platform weighted, so that as the press moves ahead, it passes over the peat which has been dumped into it, smoothing it out into a row of even thickness. Behind the press is drawn a shaft attached to which are revolving disks, that cut the row longitudinally. Afterwards a man armed with another disk attached to a long handle does the cross-cutting, which forms the bricks. During good drying weather in, say the month of June or July, the bricks, in from eight to ten days, are ready for turning, after which they are piled into stacks of from fifty to sixty bricks, in such a way as will allow for the free circulation of air. Until the peat is shipped it is left standing thus. For the carrying of the prepared peat fuel from the drying field to the shipping platform, special cars are used and are drawn by an internal combustion locomotive. A very good type of locomotive for the purpose is one made in Sweden, burning kerosene for fuel. A locomotive of this type is in use at the plant of The Peat Industries, Limited, near Farnham, Que.

Anrep Peat Machine

The complaint that peat fuel was too bulky for shipment no longer holds good, as from twenty-five to thirty tons can easily be loaded into an ordinary freight car. For the railway companies the freighting of peat is more satisfactory than other fuels, as being cleanly to handle. Any kind of cars can be used, and, being available for return freight, are not hauled back empty as in the case of coal cars. The fuel stands handling well, and once dry cannot be made to re-absorb moisture, consequently open cars can be used for transportation.

THE PEAT INDUSTRY IN QUEBEC.

A beginning has been made in the utilisation of the peat bogs of the Province of Quebec, by the operations iniated last year at Farnham by the Peat Industries, Limited. After preparing the bog, a main ditch ten feet deep, seven feet wide at the top and three feet wide at the bottom, dug for a distance of twelve hundred feet, while, in addition, surface drainage aggregating between seven and eight thousand feet was undertaken. By the time, however, that this work was completed and the machinery installed, the season was fairly advanced, and while some production was made, the remaining period before winter set in was occupied largely by experimentation with a view to perfecting the system. The system of manufacture, by the way, is a modification of Swedish methods, as devised by Aurep. In one respect only was a difficulty experienced, namely, in respect of the handling of the prepared peat. The costs have proved to be disproportionately heavy, and to remedy this state of affairs dump cars of a special design have now been provided, while the product will be drawn in train-loads by locomotives of the internal combustion type directly from the drying field to the railway cars. The company, it is affirmed, is not in the least concerned regarding the question of profitably marketing their product, for which already an excellent demand has been established.

H. M. L.

PEAT AND ITS UTILISATION FOR POWER PURPOSES.

'he successful utilisation of peat for power produc- n on a large and economical scale at Portadown, land, would appear to fully justify the convictions forcibly and frequently expressed by Dr. Eugene avel, Director of Mines for the Dominion, concern- in Canadian potentialities in this regard. The con- ions are ripe, in Ontario at least, for experimenta- n, on the part of industrial concerns, to determine v cheaply power may be developed in certain dis- ts from peat fed to gas producers. Really, that is only point upon which more precise data is, per- s, desirable or necessary. Not long since when re- ting on an important copper property near Tema- ni, Mr. John E. Hardman strongly recommended t for the operation of a plant and for the generation power required for the local reduction of the ores, peat bogs in that neighbourhood be turned to ount. There are many other localities where con- ions are similar and where the utilisation of peat uld enormously benefit and cheapen the costs of ning. The power plant in Ireland to which we have erred has a capacity of 400 brake horse-power and isists of two gas producers, each of 200 brake horse- wer capacity, coke scrubber, tar extractor, saw-dust ubber, exhauster and expansion box. Its operation extremely simple. The peat is fed into hoppers at the top of the producer, from which it falls by gravitation into the body of the producer as combustion of the lower layers of peat takes place. The gas as it is formed passes through the coke scrubber to the tar extractor, where the tar is separated from the gas by centrifugal action. The gas then passes to the sawdust scrubber, where the final cooling and cleaning takes place. It is drawn through the plant by an exhauster in the form of a high-speed fan, which delivers it to a gas-holder for use in the engines. The nature of the gas produced is similar to that of suction gas from Welsh anthracite, though it contains a smaller percentage of hydrogen gas, and the thermal value—about 140 B. T. U.—is slightly more. The cost of the peat delivered to the plant is said to be six shillings per ton. Since the weekly consumption is approximately twenty tons, the prime cost of the fuel is £6, but from this is deducted the value of the tar recovered from the plant, representing thirty-five shillings a week, or a net cost for fuel of £4 5s. Previous to the introduction of the peat plant, the factory engines were driven by a coal gas plant, consuming 8½ tons of anthracite per week at a cost of £13 16s. 3d. The cost in Ontario of cutting and delivering peat to a producer plant would probably slightly exceed the figure above quoted in respect of this item; but not necessarily so. On the other hand, the cost of anthracite would be somewhat higher. Consequently the relative costs would not be radically different from those here presented.

THE PARKS ELECTRO-CYANIDE PROCESS

By John R. Parks.*

Heretofore, practically all successful metallurgical ocesses in which cyanide salts have been used to tract gold and silver from their ores have contem- ated:

1. Removal of coarse particles of the precious metals amalgamation in a separate device before the ore is bmitted to cyanide attack.

2. Presentation of the more or less finely crushed ore chemical attack by an aqueous solution of cyanide lt, to which is added an alkali to neutralize acid radi- ls of the ore, to save cyanide salt; this solution must so contain oxygen, either the normal amount that ter will dissolve from the atmosphere, or a super- undant amount added by aero-agitating devices.

3. Separation in a clear state, by settling and filter- g devices, of the aqueous solution containing gold d silver cyanides, unused cyanide salt, and complex purities, cyanates, sulphocyanates, etc., of the base etals.

4. Continued and perfect contact of the cyanide solu- on with the shavings or dust of an inexpensive base etal which precipitates part or all of the precious etals.

5. Separation of the precipitated precious metals om the remaining base metal, washing, collecting, ying and compressing the finely divided precious etals for melting and casting into bullion.

The object of the Parks electro-cyanide process is to oply economically all of the chemical and physical rces necessary to extract and collect the precious etals, applying them at their highest potency, and simultaneously. This necessitates economy in chemicals, their almost instant presentation under their best operating conditions to every particle of precious metal in the ore, and for only such length of time as is required for a thorough chemical interchange. That this has been accomplished will be shown by quoting results of its application to simple and to refractory ores; all of these ores, in their raw state, were made to yield their precious metals rapidly in the form of amalgam, in a single operation, in a single machine, eliminating all filtering and precipitating devices.

The Parks electro-cyanide pan consists of a wooden tub, 15 ft. diameter and 30 in. deep, through the centre of which projects a small conical casting for the passage of the working shafts. Practically the entire bottom of the pan is covered by an amalgamated copper plate, to which quicksilver is automatically added during operation, in proportion to the amount of precious metal in the ore being treated. About 9 in. above the copper, or cathode, plate, a cast-iron anode plate equal in area to the copper plate is mechanically suspended. The cast-iron plate is divided into two annular rings, the outer one containing 60, and the inner one 40 per cent. of the anode area.

These annular anodes are revolved in the same direction, and independently, by means of pulleys, gears, and a solid and a hollow shaft, so that any midway point of the inner ring travels practically the same number of feet per minute as any midway point of the outer ring. On the lower side of each of the anode rings, wooden paddles 7 in. deep are fastened radially,

bstract article from the School of Mines Quarterly, Columbia Universit

about 5 ft. apart, the bottom of the paddles being 2 in. above the copper plate.

The compound rotary motions of the anode rings and their paddles give to the pulp confined between them and the cathode plate a very uniform spiral motion outward, keeping the ore in a perfect state of suspension, and at a little higher speed than pulp travels down a stamp-battery plate. By the centrifugal force of the paddles, the pulp on reaching the staves of the pan is forced up between them and the outer edge of the outer anode to a height of about 16 in. above the anode, retaining the rotary motion imparted by the paddles and now endeavouring, by gravity, to seek the lower level at the centre of the pan; the resultant motion is a downward and inward spiral until the ore passes over the inner edge of the inner anode, near the centre cone, when it again meets the paddles and starts to repeat its cycle of travel.

At the periphery of the pan, and on a level with the cathode plate, 20 jets of compressed air are admitted through needle valves set at regular intervals around the pan. The air pressure—about 12½ lb. per sq. in.—is sufficient to overcome the centrifugal force of the pulp against the valve exits and to keep them clear. The amount of air is calculated from the oxygen demanded by Elsner's formula for dissolving the precious metals by cyanide salt, with an allowance for unavoidable waste in mixing. The air, on leaving the valve, travels against the outward spiral motion of the pulp between the anode and cathode plates, and nearly all the excess makes its appearance as a slight effervescence around the centre cone, being thoroughly incorporated with the pulp; comparatively little escapes by rising to the surface without passing between the plates. At 100 lb. pressure, 1½ ft. of air per min. is an ample supply for the pan during treatment.

The writer, during the past eight years, has experimented with many iodine, bromine and other chemicals, seeking economy and efficiency, and has found nothing so effective and economical as commerical potassium or sodium cyanide, or the commercial double salt, together with common lime and common salt, aided by the sodium amalgam and caustic soda generated by the process.

The electrical factor of the process, which consumes from 75 to 80 per cent. of all the physical power necessary to operate it, and accounts for the speed, efficiency and economy of this as compared with other processes, is worthy of considerable attention.

From a 10 to 12-volts, 400-ampere, D. C. generator the positive wire, after leaving the switch and indicator board, is led to the mechanical portion of the pan in four branches, each of which terminates in a suitable brush; two play against the copper collecting ring on the solid shaft which drives the outer annulus of the anode, and two against a similar ring on the hollow shaft which drives the inner annulus of the anode. By this means, the electric current passes up the vertical driving shafts, insulated from the cone through which they pass, and proceeds down the driving arms and supporting rods to the anode annuli, where it is uniformly distributed.

The negative wire from the electric generator, after passing through the switch and indicator board, also terminates in four branches, each of which connects with a copper tail piece projecting through the pan, each tail being a portion of one of the four segments of the copper plate forming the cathode. Owing to the insulation of the machine, all the electric current must pass from anode to cathode through the pulp.

In treating a charge consisting of 7½ tons of ore (dry weight) with an equal weight of water, and containing its quota of lime previously added during the crushing of the ore, such an amount of strong cyanide solution is added as to equal 1 lb. of cyanide salt per ton of ore in the pan. The correct weight of cyanide per ton of ore may be previously determined by titrating filtered samples from the pan charge during a test run for cyanide consumption. After addition of the cyanide, finely crushed common salt is added until the ammeter registers 300 to 500 amperes, at 9.5 to 10 volts, as determined by a test run. The plan is then put in motion, the air is turned on, and the quicksilver is put into its distributor.

Many complex chemical compounds are formed, some of which are decomposed, in a manner which baffles the skill of the electro-chemist to explain, but among the established effects of the electric current the following may be stated:

The salt is decomposed by the electric current and metallic sodium is constantly precipitated on the mercury-coated copper plate, forming sodium amalgam; the sodium is converted into caustic soda, by its reaction with water, which, uniting with acid radicals in the ore, protects the cyanide from compounds from which the lime does not so readily protect it, thus saving a much larger portion of cyanide salt than can be saved without the current. Chlorine is also generated, but rarely indicates its presence, probably being united with basic radicals of the complex charge.

These several ions travel very slowly in quiet solutions, but in this mechanical device the pulp travels an average of seven miles over the copper plate in a 2½-hour treatment, presenting the cathions rapidly for discharge and deposition. This is analagous to the method by which copper is precipitated on a platinum dish, in modern electro-analysis for copper, by a revolving anode in a small fraction of the time required for precipitation in quiet solutions.

The cyanide anion probably seizes a potash or soda radical and is reconverted into nascent cyanide salt, unless a particle of precious metal, for which it has a greater affinity, presents itself first. However there can be no question as to the so-called restoration of cyanide, for the writer has frequently found much more free cyanide of potash or soda in a sample of solution taken a half hour or an hour after a previous sample.

Theoretically no mercury can be lost by scouring or flouring in the charge, as any subdivided particle of this metal too small to seek the cathode by gravity is sufficiently small to yield to electro-cyanide solution, whereby it is electro-chemically precipitated back on the plate. Practically, a small amount is lost, for in a 2,500-ton run on Ruth ore a loss of about 5 lb. was reported.

On samples containing 0.8575 oz. of gold per ton, the writer has reduced the average tailing sample to 0.0075 oz. per ton, showing an extraction of 99.1 per cent. by six hours' treatment in the electric pan, using 1 lb. KCN per ton of ore; the same ore, reduced to the same fineness, yielded but 92 per cent. to solution in 48 hours' treatment in Pachuca tank (generally recognized as one of the best aero-agitating devices) using

thre tons of solution containing 3 lb. KCN per ton, or 9 lb. of cyanide salt per ton of ore.

Many of our western precious-metal ores from oxidized zones are contaminated by carbonates of lead, zinc and copper, which preclude economic treatment by the ordinary cyanide methods, owing to the difficulty of precipitating the precious metals in the presence of the cyanides of the base metals, aside from the excessive consumption of cyanide salt. The electric current, however, precipitates the base metals as well as the precious metals, on the amalgamated plate. The writer has produced, by the electric pan, bars of bullion worth $1,200 or $1,400 which averaged but 512 fine in precious metals, the other 50 per cent. of the bars being lead, zinc and copper, alloyed with the precious metals. The refining charges on such bullion are low.

As precipitation of precious metals takes place more rapidly from strong than from weak solution, in treating certain ores economy can be introduced by discharging the pan at a fixed value of unprecipitated precious metals in solution (50 c. to $1 per ton). After passing the charge through a revolving settler used as a precautionary amalgam trap, it may then be sent through a Dorr thickener, whereby 50 per cent. of the solution from a 1:1 charge, and 80 per cent. of that from a 1½:1 charge, can be returned clear for original charges; this not only saves time and increases the daily capacity of the plant, but secures a higher percentage of recovery of the precious metals, while preventing undue waste of common salt and unused cyanide.

The total horse-power required for a single pan is 1.6 h.p. for mechanical agitation; 1 to 1.5 h.p. for compressed air; and 4.5 to 6 h.p. for electric current.

The capacity of the pan depends on the amount and character of gangue in the ore and on the nature of its precious metal minerals The proportion of gangue determines whether one ton of ore may be treated with 1 ton or will require 1½ tons of water; none but the more clayey types require the 1:1½ charge.

A single pan charge of the 1:1 class is 7.5 tons of ore, dry weight, and of 1:1½ ore, is 6 tons; the time required for treatment varies from 1 to 12 hours, generally being 2½ to 4 hours; hence the capacity of the pan, allowing for charging and discharging, varies between limits of 15 and 90 tons per diem, but on the average run of ores it varies from 36 to 60 tons per diem.

The large capacity of the pan, the small tonnage of ore under treatment in the mill at one time, and the small amount of machinery and apparatus required, reduce the total cost of installing mills using this process to 30 to 60 per cent. of the amount necessary to install any other process of equal daily capacity.

A few examples will show the efficiency of the process.

Ruth Gold Mining Company's mill, Kingman, Arizona.—Daily capacity 50 tons. Quartz ore with large amount of manganese minerals; little free gold. Values occur in sulphide minerals; ratio of gold to silver 1 to 12. Test in 40-in. testing plant. Pan charge, 215 lb.; 1 lb. KCN per ton of ore; six hours' treatment; 200-mesh pulp. Results: Precipitated as amalgam, gold 96.76 per cent.; silver 87.7 per cent.; monetary values 95.6 per cent. Shortly after the mill was turned over to the Ruth Company, three pans being used, each with 7½-ton charges, the mill foreman's samples and his assayer's results showed as follows: Precipitated as amalgam, gold 96.66 per cent., silver 87.77 per cent., monetary values 95.09 per cent.; 1 lb. KCN per ton of ore, six hours' treatment; value of ore $18 per ton.

Maginnis mill, Maiden, Montana.—One pan; 7½-ton charge; 30-mesh pulp. Oxidized ores containing 0.33 to 0.50 oz. gold and from 1.5 to 4 oz. of silver per ton, contaminated with carbonates of lead, zinc and copper. One pound KCN per ton; 2½ hours' treatment. Precipitated as amalgam, 86 to 92 per cent. gold, 62 to 72 per cent. silver. The low silver contents of this ore prohibited the economic use of cyanide salt in stronger solutions, in order to secure higher extraction from its silver minerals.

Gold ores from Kendal, Fergus County, Montana.—Decomposed, porous limestone, impregnated with gold; an ideal cyanide ore. Test of 225 lb. in testing pan; 12-mesh; 1 lb. KCN per ton; after one hour, 90.5 per cent. of gold as amalgam; after 2½ hours, 97 per cent. of gold contents of the ore reduced to amalgam. Ore valued at $8 per ton in gold.

Orient, Washington.—Auriferous, fine crystals of pyrite in andesite; no free gold. Average value, 1.03 oz., $21.29 per ton. Four hours' treatment on 230-lb. lots; 4½ lb. NaCN; pulp 120-mesh. 95.35 per cent. of gold contents saved as amalgam.

Whitman mine, Pearl, Idaho.—Ore contained arsenical pyrites, 25 to 27 per cent.; pyrite 40 per cent.; gangue 35 to 37 per cent. Six hours' treatment with 4 lb. KCN; 120-mesh. Gold, 1.3385 oz. per ton, worth $27.67; saved in form of amalgam, 88.8 per cent.

Metates mine, Sinaloa, Mexico.—Ore contained 5 per cent. pyrrhotite, with galena and antimonial sulphide minerals, in quartz gangue. Twelve hours' treatment; 230 lb., 120-mesh; 12 lb. KCN used; 7.7 consumed. Gold, 0.625 oz.; silver, 63.015 oz.; value, $44.43 per ton. Extracted in form of amalgam, 99 per cent. gold, 91.1 per cent. silver.

All of the results cited above were obtained by direct pan treatment, without returning any solution once passed through the pan.

ANNUAL REPORT OF MINISTER OF MINES FOR BRITISH COLUMBIA, FOR 1911

Reviewed by E. Jacobs, Victoria, B.C.

The Annual Report of the Minister of Mines for British Columbia for the year 1911 has been issued. It shows the mineral production for that year to have been of a total value of $23,499,072, as compared with $26,377,066 in 1910. The report intimates that the decrease in total value was due to the shutting down

of coal mines of East Kootenay for eight months owing to labour disputes, otherwise there would have been an increase to record.

The quantities and value of the several mineral products are shown in the following table:—

Gold, placer	$ 426,000
Gold, lode, 228,617 oz.	4,725,513
Total gold	$ 5,151,513
Silver, 1,892,364 oz.	958,293
Lead, 26,872,397 lb.	1,089,521
Copper, 36,927,658 lb.	4,571,644
Zinc, 2,634,544 lb.	129,092
Total metallic	$11,880,063
Coal, 2,193,062 tons of 2240 lb.	7,675,717
Coke, 66,005 tons of 2240 lb.	396,030
Miscellaneous (building materials, etc.)	3,547,262
Total value of mineral production	$23,499,072

Summary—		Value.
Metalliferous minerals		$11,880,063
Non-metalliferous minerals—		
Coal and Coke	$8,071,747	
Building materials, etc.	3,547,262	
		$11,619,009
Total		$23,499,072

Early in the year the Department published a "Preliminary Review and Estimate of Mineral Production" for 1911, in which the estimate of the Provincial Mineralogist, Mr. Wm. Fleet Robertson, was that the total value of the mineral products was $23,211,816. The revised figures show that this amount was $287,256 short of the actual value. There was, however, considerable variation in totals of value of separate minerals. Notwithstanding this, the usefulness of having an estimate published months before the revised returns were available is demonstrated, since in a general way it indicated, approximately, what last year's mineral production had been.

The Statistical Tables.

The various statistical tables included in the Report under review give much information to those interested in the mineral production and progress of the mining industry of British Columbia. Table I. shows the gross value of each of the more important of the minerals produced, and that the aggregate value for all years is $397,696,722, in the following proportions:—

		Value.
Placer gold		$ 71,639,103
Lode gold		65,536,580
Total gold		$137,175,683
Silver		32,055,895
Lead		25,715,126
Copper		65,315,049
Other metals (zinc, etc.)		1,212,264
Total metallic		$261,472,017
Coal and coke	$122,084,343	
Building, stone, bricks, etc.	14,140,362	
Total non-metallic		136,224,705
Total production		$397,696,722

Table II. shows the value of each year's total production over a period of 20 years—1892-1911. It is seen that the total for 1911 was the lowest in any year since 1905, which fact is attributable to the labour difficulties above-mentioned.

Table III. exhibits the quantities and value of production for three years, 1909, 1910 and 1911. The figures for the last year, shown above, are taken from this table. There was a general decrease in production as compared with 1910, excepting only in miscellaneous products, which showed an increase of $2,047,262, and to that extent offset the total decrease in other minerals of $4,925,256, of which latter $3,036,588 was in coal and coke, this making plainly evident the bad effects of the long-continued strike at the coal mines and coke ovens of Crow's Nest district.

Production of Districts.

Table IV exhibits the output of minerals by districts and divisions for three years. Omitting divisions and taking that of districts only for two years, for purpose of comparison, the figures of 1910 and 1911 are as under:—

Districts.	Value of Production. 1910.	1911.
Cariboo	$ 239,000	$ 180,000
Cassiar	283,807	293,442
East Kootenay	6,121,832	2,475,056
West Kootenay	5,088,186	4,343,912
Boundary	6,998,519	5,621,109
Lillooet	9,832	6,467
Coast	7,635,890	10,579,086
Totals	$26,377,066	$23,499,072

It will be observed that the greatest loss in production was in East Kootenay, which district not only had a largely decreased output of coal and coke but, as well, a considerable decrease in lead owing to the exhaustion of known ore-bodies in the St. Eugene mine, only partly compensated for by an increase in output of the Sullivan mine. West Kootenay's decrease was largely in silver and lead from Ainsworth and Clocan, and lode gold from Nelson mining division. Trail Creek's (Rossland's) proportion of the total decrease was comparatively small. The smaller production in Boundary district was due to the enforced suspension of operations at the Granby Company's mines and smeltery consequent on the cutting off of the coke supply during about five months of the year. The increase in the Coast district was due chiefly to larger production of copper and building materials the former to an amount nearly $1,000,000 greater than in 1910. It may be mentioned that in both East Kootenay and the Coast district the coal mines contribute much to the total of mineral production, and in the latter building material is a product of steadily increasing total value. In other districts the production is to a very large extent of metalliferous minerals only.

Various Mineral Products.

T le V. is a new table, shown for the first time in 11 Report. It is an endeavour to give details of iscellaneous products included in the year's min- roduction, mostly of the various kinds of building ials, such as cement, lime, building stone, rock, products, etc., which in previous reports were arized in one total. While the figures given in able are not complete, they are at least approxi- and show what an important branch of mineral ction miscellaneous products has become.

les VI., VII. and VIII. are the customary record rly totals of placer gold, lode metals and coal and respectively. Table IX., which is the most elab- in the Report, and which was changed to some t the previous year, has been further altered, to xtent of transferring from it "miscellaneous prod-" and showing in it only the details of metalliferous uction for four years, 1908-1911, and the districts hich such production was made. Tonnage of ore l and its metallic contents and market value are n in this table.

Comparison With Other Provinces.

ble X. presents in graphic form the facts shown in es in other tables, and demonstrates to the eye the th of mineral production and the fluctuations to h it has been subject. Table XI. compares graphi- the output of certain mineral products of British mbia with the combined output of similar products the other provinces of the Dominion. An analysis e figures gives the result that British Columbia uces more lode gold, copper and lead than all the of the Dominion combined, and is to be credited nearly one-third of the coal and coke production anada.

Men Employed in Mining.

summary of the figures showing the number of employed in several classes of mines follows:—

ere were 80 mines that shipped ore in 1911 (45 of more than 100 tons each, but only 33 more than tons each), and there were employed in these a l of 3,241 men—1,008 above and 2,233 below nd. The non-shipping mines numberd 67, of which were idle and 21 working; in the latter 353 men employed—151 above and 202 below ground. The l number employed at metalliferous mines was, efore, 3,594 men.

he coal mines gave employment to a total of 6,873, number including 230 boys among the 6,146 whites, the following other classes of labour:—Japanese Chinese 530, Indians 13; total, 727. There were loyed underground 4,818 white men, 149 white s, 171 Japanese, 71 Chinese and 3 Indians. This ws that of the total of 5,212 employed underground, 67 were whites and only 245 were of other races.

rom the foregoing it will be seen that there were loyed at metalliferous mines 3,594, and at coal es 6,873; total, 10,467. It may be taken for granted t men engaged in prospecting were not included, l probably the figures omit as well men employed at lting works, but of this there is not any mention.

Quantity and Sources of Ore Mined.

he total quantity of ore mined in 1911 was 1,770,- tons, which compares unfavourably with a total of 2,216,428 tons in 1910. The cause of this decrease, however, was simply that the requisite supply of fuel could not be obtained while the Crow's Nest miners were on strike, so at some important properties ore could not be mined and smelted until supplies of coal and coke were received. The percentage of tonnage of the various districts was as under:—

	Per cent.
Boundary district	70.30
Trail Creek mining division (Rossland)	14.35
Coast district	8.09
Slocan district	2.56
Nelson mining division	2.25
Ft.Steele mining division (E. Kootenay)	1.73
Other divisions	0.72
	100.00

Taking the Province as a whole, there was 546 tons of ore mined in the year for each man employed about the shipping mines. The figures ranged from 1,201 tons to the man in Boundary district down to 113 tons a man in Slocan.

Output of Coal and Coke.

The gross output of coal mined in 1911, that is, including the coal made into coke, was 2,297,718 tons (of 2,240 lb.), as against 3,139,235 tons in 1910. The net tonnage of coal in the two years was 2,193,062 tons in 1911 and 2,800,046 tons in 1910. The coke figures for the two years are: for 1911, 66,005long tons, and for 1910, 218,029 tons. The net decrease in 1911 as compared with 1910 was, therefore, 606,984 tons of coal and 152,024 tons of coke.

The gross production of the several collieries was as follows:—

		Long Tons.
Vancouver Island—		
Canadian Collieries (Dunsmuir), Ltd.	788,911	
Western Fuel Company	575,177	
Pacific Coast Coal Mines, Ltd.	208,116	
Vancouver-Nanaimo Coal Mining Co., Ltd.	72,918	
		1,625,122
Nicola Valley—		
Nicola Valley Coal and Coke Co., Ltd.	191,290	
Inland Coal and Coke Co.	10,883	
Diamond Vale Collieries	4,970	
		207,143
Similkameen—		
Princeton Coal and Land Co., Ltd.		23,396
Crow's Nest		
Crow's Nest Pass Coal Co., Ltd.	320,940	
Corbin Coal and Coke Co.	81,718	
Hosmer Mines, Ltd.	39,399	
		442,057
Gross production of coal		2,297,718

Of the 66,005 long tons of coke, the Crow's Nest Pass Coal Co., Ltd., produced 54,160 tons and the Hosmer Mines, Ltd., 11,845 tons.

Where Bulk of Metals is Mined.

Of the total of $426,000 of placer gold, $225,000 s from Atlin division, and $170,000 from Cariboo and Quesnel divisions of Cariboo district.

Rossland mines contributed nearly $2,412,000 of the total of lode gold, Boundary mines (including Hedley) nearly $1,814,000, those of Nelson division $365,000, and of the Coast district $120,000. Small amounts from other parts made up the remainder of the total of $4,725,513.

Slocan district mines, including those of Ainsworth, produced silver to the value of $441,000, East Kootenay $167,000, Boundary $166,000, the Coast $51,000, Rossland $45,000, Nelson $39,000, Lardeau $34,000, and smaller amounts from Portland Canal and elsewhere. The total was $958,293.

Lead production was of a total value of $1,069,521, of which Fort Steele division of East Kootenay produced $683,000, Slocan and Ainsworth $278,000, Nelson $77,000, Lardeau $20,000, and nearly $10,000 from Portland canal.

The chief output of copper was from Boundary mines, with a total value of $2,764,000, while Coast mines came next with $1,362,000, followed by Rossland with $425,000, and several small amounts to make up the remainder of the total value of $4,571,644.

The production of zinc, valued at $129,092, came from the Van-Roi and Hewitt mines, near Silverton, Slocan Lake, chiefly from the former.

Some Noteworthy Features of Report.

In addition to much interesting and valuable comment by the Provincial Mineralogist, under the head of "Progress of Mining," there are features of the Report that are noteworthy. These include the reports of the Provincial Assayer and the Secretary of the Board of Examiners for Coal-Mine Officials, respectively, those of the gold commissioners for Cariboo, Atlin, Queen Charlotte, Omineca, Nelson, Grand Forks, Osooyoos and others, and the several special reports and compilations by the Provincial Mineralogist.

Among subjects of interest concerning which there is information are the following: Notes on Iskut river, Unuk River district, a special report on Alice Arm camp, Observatory inlet, including a description of the Granby Company's Hidden Creek mines, by Mr. Donald G. Forbes (under instructions from the Hon. the Minister of Mines); lengthy notes on the new coal field at the headquarters of Skeena River, north of Groundhog mountain (compiled by the Provincial Mineralogist), and of coal areas in the southern part of Skeena district; a long report on mineral claims in Hazelton district, and another on Slocan mining division, both by the Provincial Mineralogist; notes on "French's Process for Separation of Zinc and Lead," and others on an investigation made by the Department in connection with the reported discovery of platinum in the vicinity of Nelson, the result being that not a trace of platinum was found in the guaranteed samples supplied by interested parties; notes on demonstration of smelting copper ore at Van Anda with an oil-fired furnace; notes on the Britannia mine, Howe Sound, by the Provincial Mineralogist; and one report on mines on Texada island and another on the "Limestone Deposits of the Coast," both by Mr. Herbert Carmichael, Provincial Government Assayer. A comprehensive review of coal mining in the Province, and the reports of the inspectors of mines also add greatly to the value of the Report.

Report is Well Illustrated.

Reproductions of photographic views are numerous in the Report, many of the half-tones being excellent and well-printed. Zinc-line cuts and lithographs are also used for illustrative purposes; among these are two maps of Skeena district, drawn by Mr. H. T. Nation, of the provincial mineralogist's office. The flow-sheets of concentrating mills are great improvements on the old-style plans, for these show the jigs in profile instead of by plan, this improvement being an invention, several years ago, by Mr. W. F. Robertson, and one now freely used in Canada and the United States; further, the shape of the concentrating table is shown, and generally the mill arrangements are shown in a more graphic way than has been the custom in other official reports.

Illustrations in the text show the oil-fuel blast furnace; and the profile, plan and installations of high-carbon steel plates and manganese rails at the Quesnelle Hydraulic Gold Mining Co.'s mine, Quesnel division.

A full index makes the Report complete. Altogether, this Report is about the best, on the whole, issued in late years by the Provincial Department of Mines, and it reflects much credit on the Provincial Mineralogist who did the chief work in its preperation, on the officials who assisted him and on the Government printing office for its excellent printing and press work.

PERSONAL AND GENERAL

Mr. W. G. Ross, president of the Asbestos Corporation of Canada, accompanied by other members of the directorate, left Montreal on July 9th to inspect the company's property.

Mr. E. A. Vajda, of Buda Pesth, representing the Society of Engineers of Austria-Hungary, is visiting Ottawa with a view to gathering information concerning the methods adopted by the Department of Mines to develop the peat industry in this country.

At the last meeting of the Council of the Canadian Mining Institute, fourteen candidates were admitted to full membership; ten to associate membership; and two to student membership. The new members are: L. D. Adams, of Weedon, Que.; H. C. Anchor, of South Porcupine, Ont.; Thos. J. Brown, of Sydney Mines, N.S.; Victor H. Emery, of Schumacher, Ont.; Stanley O. Fillion, of Ottawa, Ont.; J. M. Gordon, of Glace Bay, N.S.; Geo. M. Guess, of Toronto, Ont.; Wm. Kelly, of Vulcan, Mich., U.S.A.; Arthur J. Merrill, of Winnipeg, Man.; P. A. Robbins, of Timmins, Ont.; H. Y. Russel, of South Porcupine, Ont.; Chas. G. Titus, of Cobalt, Ont.; J. C. Watson, of South Porcupine, Ont.; and Wm. H. Wylie, of St. Catharines, Ont. Associates, F. C. Annesley, of Toronto, Ont.; Hugh Boyle, of South Porcupine, Ont.; James E. Boyle, of South Porcupine, Ont.; Arthur I. Davis, of Toronto, Ont.; Thos. B. Dunkin, of Toronto, Ont.; John Gray, of Toronto, Ont.; Henry B. Haigh, of New York City, U.S.A.; W. W. Newman, of

ntsville, Ala., U.S.A.; and H. A. Proctor, of South reupine, Ont. Students: P. E. Hopkins, of Toronto, t.; and A. J. McLaren, of Toronto, Ont.

The Hon. Frank Cochrane and Major R. W. Leonard e on their way to Prince Rupert.

Mr. Edgar L. Mocatta, of the firm of Mocatta & ldsmid, London, was a guest of Mr. Samuel Cohen the Crown Reserve mine, Cobalt, for several days rly in July.

Mr. C. F. Beamer, formerly general manager of the balt Power Co., is now chief electrical engineer to e Government of Mysore, Bangalore, India.

Mr. G. C. Mackenzie, of Ottawa, is in charge of drill-g operations to test the depth of the iron sands at atashquan, Que.

Mr. Charles Brent, president of the Canadian Home-ake Mine, at Kenora, was in Montreal recently.

Mr. Alex. MacKay, a mining engineer of London, is xamining coal mines near Banff on behalf of English ivestors.

On Friday, July 13th, Miss Clara McCall, daughter f Mrs. D. McCall, 163 Spadina Road, Toronto, and Mr. . H. Gillespie, Madoc, Ont., were united in the holy onds of matrimony. Mr. and Mrs. Gillespie are pending their honeymon in New England. The ridegroom is known to our readers as the organizer of he talc-grinding industry in Ontario and as an occasional contributor to these columns. This event makes the ninth or tenth serious defection from the ranks of bachelordam in the mining profession.

Mr. R. B. Lamb is sailing for England on July 20th, and will be absent for about a month.

Peter McLaren, of the Scottish Ontario Goldfields, sailed on the S.S. Grampian for England on July 5th last, and will remain abroad for some weeks.

When in Montreal recently, Mr. J. H. Plummer, president of the Dominion Steel Company, announced that it was the intention of the Canadian Steel interests to again submit their views to the Government respecting the tariff in iron and steel products.

The following gentlemen were elected to the directorate of the Asbestos Corporation of Canada: President, Mr. W. G. Ross; Vice-President, Mr. Howard E. Mitchell; and Messrs. W. McMaster, H. J. Fuller, Thomas McDougall, W. N. McCarter, and C. W. Colby.

The death occurred at Toronto on July 2nd of Mr. Cecil B. Smith, the eminent hydro-electrical engineer, at the relatively early age of 48 years. Mr. Smith was a graduate of McGill University, for a term president of the Canadian Society of Civil Engineers, and the author of several text-books on engineering.

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, Gowganda and South Lorrain.—If the No. 9 vein of the Coniagas continues to the 200-ft. level in the Keewatin it has been heavily faulted. So much exploration work has conclusively shown. Some months ago, when it was found that the No. 9 vein crossed the contact into the keewatin and held its values, hopes were entertained that it might not be a solitary example of the rule that veins found in the conglomerate lost their value when the contact was reached. For one hundred and fifty feet to the west on the upper level the drift continued in rich ore, and when a winze was put down ten feet the results were still good. Then it was determined to run a crosscut from the 200-foot level of the mine and demonstrate conclusively the value of the new discovery. So far the vein has not been picked up. It may be that the vein has been faulted and still contains good ore.

In the new shaft which Sir Henry Pellatt and his associates have sunk on the Ophir a very strong vein of smaltite and niccolite has been followed down. It is between six and seven inches wide, and the hope of the new management is that the silver values will increase with depth. The adjoining property, the John Black, is also working again on their big smaltite vein. So far in this section, while the veins have been wide and strong, the silver values have been too low to permit of work. Mr. Chas. A. O'Connell, who succeeded Mr. George McNaughton as manager of the Trethewey mine a little more than a year ago, has resigned his position. His place is to be taken by Mr. Horace Young, once manager of the Temiskaming and Hudson's Bay mine, who has therefore a good working knowledge of conditions as they apply to that particular section of the West Ridge.

The Buffalo mill report for May shows a recovery of 109,295 ounces, as compared with 91,542 ounces for the previous month. A total of 4,553 tons were milled, while the ore ran 28.22 ounces. The company has paid in dividends to date $1,457,000.

Dividends paid by the Cobalt mines for the first six months of the year shows a net loss of but $8,376 in comparison with the first six months of the previous year, and as the gains are to all intents permanent and the losses temporary or long ago discounted, the report is better than its face value would appear. The payments in the last six months were:—

	Per cent. of issued capital.	Amount paid.
Beaver	3	$59,892
Buffalo	16	160,000
Townsite	15	150,000
Coniagas	15	600,000
Crown Reserve	30	530,640
Hudson Bay	900	69,849
Kerr Lake	10	300,000
La Rose	4	337,500
McKinley - Darragh	20	224,693
Nipissing	15	900,000
Temiskaming	3	75,000
Trethewey	10	100,000
Wettlaufer	10	70,825
		$3,578,399

The Steindler Syndicate, which purchased the assets of the defaulting Nova Scotia Cobalt Silver Mining Company, has decided not to trade under the old name and will henceforth be known as the Dominion Reduction Company. They are at present operating the mill on

ore which comes to them on the aerial tramway from the Crown Reserve and are at the same time making such additions to their mill that the conglomerate and Keewatin rock can be treated so that a profitable extraction can be made.

With the last two and a half per cent. dividend announcement of the La Rose Consolidated, this company will have paid and declared 42 per cent. of the issued capitalization, or $2,954,185.

Owing to the fire in the centre of the town, the City of Cobalt is now able to do surface trenching for veins, exploration previously denied to the company owing to the fact that the land was covered with buildings. So far no veins of any importance have been located. The City of Cobalt has now a level cut at the 400-foot level. One of the exploratory drifts at the 200-foot has been pushed right across from the Buffalo boundary to the spot where the Cobalt Hotel used to be before the fire. Ore is still being carted out to the King Edward mill and there concentrated.

Porcupine, Swastika, and Other Gold Sections.

No official figures are as yet available as to the production of the Porcupine camp, but making all allowances for interruption of practice owing to readjustments to be made in the Hollinger and Vipond mills, it is certain that in the month of July the four plants will earn between $40,000 and $50,000. The Dome, Hollinger, Vipond and McIntyre are crushing at least 615 tons per day, and if an average of $10 a ton be allowed for 28 days in the month production will amount to $172,000. The Dome is now treating 300 tons every day in the week and running quite smoothly. Clean-ups are made every shift and shipments once every three weeks. The extraction is all that can be desired and contrary to prevailing reports the cyanide process is more than paying for its installation. The Hollinger cannot expect to get a duty of more than six tons per stamp for the next month if thirty stamps are dropped. The McIntyre is paying running expenses and more with the little ten-stamp mill, and is treating about 60 tons per day, and the Vipond has demonstrated that the Hardinge principle of crushing will give big tonnage. The guaranteed tonnage can easily be reached and operations so far have demonstrated that extraction should be satisfactory. The tailings will be run into a swamp already dammed up and they will be available for future treatment. All the saving will be made by amalgamation.

After a carefully planned campaign of diamond drilling the Porcupine Lake Mines Company has decided to put in a plant large enough to conduct operations on a considerable scale. The company owns the Hunter claims, which include a considerable portion of the north end of Porcupine Lake and the east side running right into the settlement of Porcupine. Last summer from the shore and last winter on the ice two diamond drills were almost continuously operated with uniformly satisfactory results. The gold is very fine, but in many cores it was visible to the naked eye and the assays from the cores taken out gave an average which should leave a very good margin for profitable mining. To discover the throw of a vein which appears to be faulted a shallow pit was put down on the vein and some very pretty specimens of ore were taken out, though on the surface there was no visible enrichment. The Hunter claims were staked a full year before Porcupine became known as a mining camp and operations have been conducted with commendable caution and economy.

The copper property owned by the McKinnon Syndicate, about four miles from Dane, on the Larder Lake road, is attracting considerable attention. One shaft is down 120 feet in a quartz vein ten or twelve feet wide, carrying about two per cent. of copper. This vein appears to be fairly continuous and promises to yield a good tonnage of ore. The other vein is of chalcopyrite and the ore appears to occur in lenses. These lenses are about six feet wide, three feet of massive and three feet of disseminate ore. The massive ore runs no less than seventeen per cent. in copper.

The Tough Oake claims in Lebel Township, six miles north of Swastika, have attracted a considerable amount of attention to what is known locally as the Hyland Lake section. About six months ago claims were staked all round Hyland Lake, a small sheet of water four miles from Swastika, over an excellent trail. The Tough brothers went further afield to the north, and eventually found quartz veins in a bald dome of porphyry rising above a swamp. Here they did assessment work and eventually uncovered a native gold in quartz veins scattered through a reddish porphyry. This dyke of porphyry appears to be of considerable width, and as it is exposed to-day it is from twelve to fifteen feet wide, but only the most superficial trenching has been done. The visible gold is associated with streaks of tourmaline.

Another vein of quartz in the porphyry will certainly not average more than four inches wide, but for 250 feet it is very well defined and extremely spectacular in a number of places. The porphyry is heavy in fine sulphides, which, according to the report of Mr. A. A. Cole to the T. & N. O. commission, carries values. Quite a number of men acting as scouts for the large interests operating in Northern Ontario, have been to the property and have sampled it. It is reported that the properties are for sale at $125,000, the vendors allowing a considerable time in which to make payments. Considering the spectacular character of the find there are not many prospectors in the district and nothing but bare assessment work has been carried out.

On the premises that Ontario, south of Cochrane, has been so far explored that no large field is likely to be found, prospecting this year is very busy with Labrador, Ungava and Hudson's Bay.

Both the Lucky Scott and the Munn expeditions have sailed and both appear to have good chances of success. Both are adequately financed and have good and reliable men acting as guides and in the direction of the party. Gold, diamonds, even furs may be the incentive. Captain Munn, who has just sailed from Sydney, C.B., in charge of the s.s. Algerine, is well-known in Porcupine and Gowganda, where he has both owned and operated properties. He is acting for the Porcupine (Canada) Mining & Development Company, the English syndicate, which recently acquired options and purchased so much moose pasture in the Porcupine camp. Captain Bartlett, who is acting as navigator, is a Newfoundlander with a life's acquaintance of the Labrador coast. He was well known in Porcupine where he was in charge of the Achilles property for some months. With the party also is "Bill" Woodney, acknowledged to be one of the most experienced and keenest prospectors in the country. The party will have the good wishes of all North Ontario.

Excavating for the ten-stamp mill to be erected at the Swastika mine has commenced. The mill is to be placed below the main shaft right on the edge of Otto

, an ideal location. A station has been cut at the oot level and the vein is at least twelve feet wide artz. Some visible gold is to be seen, but no assays as yet been made public.

BRITISH COLUMBIA.

e information received in Spokane, Washington, at end of June from Mr. W. E. Zwicky, manager of Rambler-Cariboo Mines, Ltd., to the effect that an ch vein of high-grade galena had been cut in the -foot level of the company's mine in McGuigan n, Slocan District, is particularly gratifying, since is the greatest depth at which payable ore has found in that district. It is stated that this is ght to be a new vein, for it was encountered about feet short of the distance at which it had been calted the ore-shoot opened on the 1200-foot level ld be reached. Further, it is said to occur in a ation quite different to that in which ore was d on the levels above, so that it looks like a parallel not met with at less depth.

ining, on what is known as the Rambler-Cariboo up, has been carried on under various ownerships a period of about 19 years. The group has been ed since the spring of 1899 by the Rambler-Cariboo es, Ltd. The total value (gross) of ore taken from property may be roughly estimated at $1,750,000 to 00,000. In earlier years a total of $230,000 was l in dividends, but so much development work has done during the last eight years that the proceeds ll ore shipped have been expended in opening the e for later production, and this at much lower cost was practicable before the scheme of deep-level elopment was adopted.

r. Zwicky took charge of the mine in 1902. After orough study of its known ore bodies, from which to that time silver-lead ore having a gross value of ut $800,000 had been extracted, he concluded that y continue down to considerable depth, but it was cult to instil similar confidence in their permanence the minds of those having to finance the costly lertaking of driving a long adit to a low level. Eveny, however, it became plainly evident that as greater th was reached in sinking from No. 3 level in the workings costs increased considerably, every addial 100 feet of depth involving an increase of 20 to per cent. in working costs. Under these difficult conons, Mr. Zwicky's recommendation that an entirely erent plan of development be adopted at last found our with the directors, and he was authorized to ceed with the work of driving a cross-cut tunnel a tance of between 4,000 and 5,000 feet, with the object cutting the vein at a depth of 1,400 feet below the crop, or 600 feet below the lowest level of the old rkings. "We had reached the limit of our power nt," said Mr. Zwicky, in June, 1904, "and we had decide to either drive the long tunnel or put in a w and larger plant so that we could go deeper. To the latter and sink to the level where the tunnel ll cut the vein would cost as much as, or more than, iving the tunnel, beside which our expenses each year uld be enormous for pumping alone, as the deeper got and the more ground we opened, the more ter we would have to contend with."

Work on the deep-level adit was commenced on July 1904. By May, 1906, a distance of about 4,500 feet d been driven. Several small veins of ore were cut but not the main vein, so as funds were low a raise was commenced. At about 200 feet up it entered the vein, giving a depth of 400 feet below the old bottom level and 1,200 feet from the outcrop. Thence up to the 800-foot level the raise was made large enough for later use as a three-compartment main working shaft, 12 feet by 4 feet 6 inches in the clear.

The following description of the property has been taken from "Notes on Slocan Mining Division," printed in the "Annual Report of the Minister of Mines" for 1911:

"The Rambler-Cariboo group includes the Rambler, Cariboo, Antelope, Humprey, Keno and Best Fraction, situated well up in McGuigan basin, at an altitude of 6,000 feet. McGuigan basin drains into the Middle fork of Carpenter creek, about three miles below the Bear Lake summit. The Kaslo & Slocan railway grade from Kaslo to Sandon is on this hillside of the Middle fork, at an elevation of about 3,500 feet; this railway formerly supplied transportation to the mine, but since the railway was destroyed by fire in 1910, and has not yet been rebuilt, the only outlet for the mine has been by wagon road down the Middle fork to Three Forks, a station on the Canadian Pacific Railway. The C.P.R. is, however, this summer engaged in extending its tracks from Three Forks up to Bear Lake, the grading being nearly completed, and by the end of the summer it should afford railway service to the mine.

"The mine is now held by the Rambler-Cariboo Mines, Ltd., a company with an authorized capital of $1,750,000, and the head office at Kaslo, B.C. A. F. McLaine, of Spokane, is president, and W. E. Zwicky, Kaslo, general manager. This property has, under various ownerships, been one of the largest shippers in the district. The following is a rough estimate of the total shipments, including the crude ore and concentrates, made by the mine to the end of 1910: Shipments since 1893 have been about 23,384 tons, containing 2,216,800 oz. of silver and 13,676,885 lbs of lead; these figures show the average realized assay of shipments to have been about 95 oz. of silver to the ton and 30 per cent. lead. In addition, the ore contains from 10 to 14 per cent. zinc.

"The rock formation of the district is slate, through which a great boss of granite has been forced up, the whole being much cut by porphyry dikes. A well-defined quartz vein cuts through both the slate and the granite, crossing the contact, and has been traced on the surface for a long distance, in a north-east-by-north direction, with a dip to the south, or into the hill.

"The mine was originally opened by three-cross-cut tunnels, connecting with levels about 100 feet apart. No. 3 is the main working tunnel, and has a cross-cut 510 feet long to the vein, and drifts to the extent of more than 1,200 feet; above this level all the ore, except a few small bunches, was extracted some time ago. From this No. 3 level a shaft was sunk 500 feet, with levels Nos. 4, 5, 6, 7 and 8 at intervals of about 100 feet, and here the recent productive mining has been done. From the shaft, drifts have been driven at No. 4 level to the north for 63 feet and to the south for 350 feet (most of which ground has been stoped); at No. 7, to the north 231 feet and to the south 324 feet, of which 250 feet has been stoped; and at No. 8, to the north 94 feet and to the south 101 feet. From this shaft and levels some very good ore was obtained, and it is reported by the management that the ore body is strong in the bottom of the shaft and is continuing with depth.

The expense of hoisting from this shaft to a higher level, together with the cost of keeping it unwatered, added so much to the cost of mining that the company decided to abandon the workings temporarily, and to drive a long cross-cut tunnel to the vein at the 1,400-foot level, putting up a raise in continuation of the shaft, thus reaching the known ore body from below. Mr. Zwicky said he felt sure he had sufficient ore in sight on levels 7 and 8 to liquidate any loan obtained to complete the new work.

"The portal of the new tunnel is located on Dardanelles creek, about halfway between McGuigan Station and the old mine-workings, and near the wagon road. The tunnel is 9 feet 6 inches high by 7 feet wide (7 feet 6 inches by 7 feet in the clear) and about 4,500 feet long, cutting the vein at more than 1,400 feet deep, or 600 feet deeper than No. 8 level.

"The contract price at which the first 2,500 feet of this tunnel was driven was between $10.50 and $11.50 per lin. foot, the company supplying only the compressed air for drills, the contract price covering everything else; the remainder of the tunnel was driven by day work. The gross cost of the entire tunnel, including management and all expenses, was $14.60 a lin. foot, and the rate of progress made was 7 feet 3 inches a day of 24 hours.

"This lower tunnel is about 4,500 feet from the portal to the intersection of the vein on the 1400-foot level. The vein at this part of the 1400-foot level was, for some reason, so tight that when the tunnel was driven through it, it was not recognized and the tunnel was driven 90 feet past the point where the projection of the vein indicated it should be; consequently it was determined to reach the vein at the nearest point under the old shaft, and a diagonal drift was made, from which a raise was started in country rock; when this raise had been put up for 200 feet, at the 1200-foot level, a cross-cut was made, and, after having driven 47 feet, cut the vein, which was here found to be 8 feet wide, and showed several streaks of clean galena. From the 1200-foot level upwards, raising was continued, on the vein, to the 800-foot level.

"Subsequently, a second raise was put up from the 1400-foot level, so as to connect and be in line with the raise from the 1200-foot up to the 800-foot level. The ore shoots above the 800-foot level have been nearly all exhausted, and this raise and its levels constitute a new mine.

"From the raise, various levels have been driven on the vein; at the 1400-foot level, for 390 feet to south and 140 feet to north; at the 1200-foot level, for 600 feet to south and about 140 feet to north. Levels were also started at the 1050-foot and 900-foot levels, and have been driven some distance.

"The ore bodies in the old workings were chiefly to the north of the line of the raise; one ore shoot on the 700-foot north level was 60 feet long in the level, and this same shoot was also cut by the 900-foot north level, but it has not, as yet, been found on the 1050-foot north level, although some scattered ore was encountered. The 1200- and 1400-foot north levels have not been driven far enough to find the ore shoots which, it is thought, probably exist in that ground.

"To the south of the raise a first ore shoot extends from the 700-foot south level, down past the 900-foot level, but this shoot has not been reached by the 1050-foot south level, although cut by the 1200-foot level; the top of another shoot, or lens, appears on the 1050-foot level and is cut by the 1200-foot level, on which it extends on the level for some 60 feet, and contains ore, from 8 to 16 inches in width, of the usual grade.

"A little farther in on these south levels the south ore shoot extends from the 700-foot level downwards to the 1200-foot level; at the 800-foot level it is 75 feet long; at the 900-foot, 160 feet long, by about 5 feet wide; at the 1050-foot level it is about 60 feet long by 7 feet thick; while, at the 1200-foot level, this level, in September, had been driven on the shoot for about 100 feet and the face was still in ore. (Later reports from Mr. Zwicky say that since then the tunnel has been driven another 100 feet in ore, with ore still in the face, and that the clean ore was, in places, as wide as 7 feet.) At the time the mine was visited (September, 1911), this face showed about 4 feet wide of clean ore and about 3 feet of milling ore. This ore-face was one of the finest showings seen in the Slocan; the ore aws usually rich in silver, containing much 'grey copper.' Both the shoots on the 1200-foot south are strong in the floor and evidently continue downward, but they had not at that time been found on the 1400-foot level.

"No attempt was made to estimate the tonnage of the ore already blocked out, but it is large, and more is being opened each day as the development progresses. The development work in progress provides enough ore at present and no stoping is being done.

"The success met with in these deeper developments more than fulfils Mr. Zwicky's expectations, and justifies his judgment in driving the long tunnel at such a depth and the difficult raise, an undertaking which, it must be admitted, was considered at the time to be at least risky, and calling for much pluck on behalf of the directorate of the company.

"This successful attempt at deep mining, in addition to its effect on this individual company's prospects, has had a marked effect on the future of the Slocan in general, giving encouragement to other companies to develop to a greater depth. Several other of these later attempts have also been successful, which has increased the confidence that deeper mining here has not only possibilities, but probabilities.

"The long tunnel has been driven absolutely straight, and is equipped with a single track with necessary turn-outs at the inner end, over which track one horse has no difficulty in hauling a trip of four to six mine cars, each carrying from 2½ to 3½ tons of material. The workmen are taken in and out through the tunnel on specially designed cars, propelled by hand power.

"The ore from the levels is sent in a chute down the raise to the 1400-foot level, where suitable bins are provided, from which the ore is run into the tunnel cars and transported to an ore house of temporary construction, where it is roughly sorted and clean ore shipped by four-horse teams to Three Forks, a team being able to make the round trip in a day."

It may be added that the erection of a concentrating mill in Middle fork valley, close to the new railway line from Three Forks to Bear Lake and the construction of an aerial tramway from the portal of the 1400-foot adit level down to the mill, are in hand, while steel is being laid on the railway, so it would appear probable that late in the ensuing autumn shipment of ore and concentrates in much larger quantity than in the past will be undertaken.

COMPANY NOTES

SWASTIKA.

The Swastika's Company has just circulated an in-t·im report to shareholders, which states that levels a now opened at 100, 200, 300 and 400 feet. The main s aft has reached a depth of 420 feet, and for the pres-t sinking will be discontinued. A station has been t at 400 feet and the shaft timbered and the cages nning to that level.

Development on the 300-foot level to the extent of 0 feet of cross-cutting and drifting has been done. e on this level has been developed for a length of ap-oximately eighty feet.

On the 400-foot level a cross-cut has been extended st to meet the ore body.

The directors feel that sufficient development work s now been accomplished to proceed with the erection of a 10-stamp mill, complete but without cyanide equipment. It is estimated that the cost of the mill when finished, including engine, will be about $18.000.

The directors expect milling to begin in September.

MOND NICKEL.

The accounts of the Mond Nickel Company, Ltd., show that the net profit for the year ended 30th April last amounted to £154,364, out of which the directors recommended a dividend of 16¼ per cent. on the ordinary shares and 10s. 5d. per share on Deferred shares, placing £35,000 to reserve and carrying forward £41,381.

LE ROI NO. 2.

The directors of Le Roi No. 2, Ltd., have declared a dividend of 1s. per share, free of income tax.

STATISTICS AND RETURNS

B. C. COPPER.

The British Columbia Copper Co. reports its output f copper for the month of June at 996.000 pounds, hich is an average production. Reports indicate that e production for the current month will be larger. The actual production of 1911 was $16.500.000, or over a million dollars ahead of 1910. The total output of the camp from 1904 to January 1st, 1912, was $64,918,752.

COBALT ORE SHIPMENTS.

The following table shows the Cobalt ore shipments or the past week and for the year to date:

	Week.	To Date.
Beaver	......	361.756
Buffalo	48,600	1,227,503
Can. Gowganda	......	15,967
Casey Cobalt	......	724,708
Chambers-Ferland	......	461,500
City of Cobalt	......	291,712
Cobalt Lake	......	683.199
Cobalt Townsite	64.140	1,522.363
Colonial	......	83,200
Coniagas	21,078	2,021.671
Crown Reserve	......	618.981
Drummond	......	682.595
Hudson Bay	62.967	752,417
Kerr Lake	121,107	839,080
La Rose	151,066	3,761,136
Lost and Found	30,001	30,001
Man (Gowganda)	......	40.000
McKinley	21,776	2,645.593
Millerett	......	196,000
Miller Lake-O'Brien	......	145,500
Nipissing	18.826	2.229.779
O'Brien	......	589.393
Provincial	......	44,440
Right-of-Way	......	290.296
Temiskaming	......	1,153,882
Trethewey	85,300	545.972
Wettlaufer	......	216.470
Totals	604.860	22.207.823

The ore shipments in tons since the discovery of the camp follow:

1911	26,763	1907	14.000
1910	39.977	1906	5.136
1909	30,096	1905	3.144
1908	25,463	1904	153

The above record does not include the silver bullion shipments, which have increased materially of late.

B. C. ORE SHIPMENTS.

Ore production and smelter receipts for the week ending June 29th, are as follows:—

Slocan and Ainsworth.

	Week.	Year.
Standard	211	4.602
Van Roi	31	1,511
Rambler-Cariboo	31	641
Reco	43	99
Meteor	27	27
No. 1	25	401
Standard, milled	400	7,800
Van Roi, milled	1,100	30,600
Other mines	.....	2,514
Total	1,868	48,195

Rossland Production.

	Week.	Year.
Centre Star	3,557	77,581
Le Roi	956	23,760
Le Roi No. 2	369	13,859
Le Roi No. 2, milled	300	7,600
Other mines	.....	79
Total	5,182	122,879

Nelson.

	Week.	Year.
Arlington, Erie	46	770
Queen	36	259
Queen, milled	300	6,300
Granite-Poorman, milled	250	6,750
Molly Gibson, milled	300	1,500
Mother Lode, milled	350	1,350
Other mines	.....	4.504
Total	1,282	21,433

East Kootenay.

	Week.	Year.
Sullivan	845	16,084
Monarch	77	380
Monarch, milled	200	4,800
Other mines	.....	1,029
Total	1.122	22.293

SHARE MARKET

SILVER PRICES.

	New York cents.	London pence.
June 7	60¾	28
" 8	60¾	28
" 10	60¾	28
" 11	61⅛	28⅛
" 12	61⅛	28⅛
" 13	61⅛	28 3/16
" 14	61⅛	28 5/16
" 15	61⅛	28⅛
" 17	61¼	28 3/16
" 18	61¼	28 3/16
" 19	61⅜	28¼
" 20	61⅝¼	28⅜
" 21	61¾	28 7/16
" 22	62	28 9/16
" 24	62	28 9/16
" 25	61¾	28 7/16
" 26	61½	28 5/16
" 27	61⅝	28⅜
" 28	61⅜	28¼
" 29	61¼	28 3/16
July 1	61¼	28 3/16
¼ " 2	61⅛	28⅛
" 3	61⅛	....
" 4	Holliday	28 3/16
" 5	61⅛	28⅛

TORONTO MARKETS.

July 9 (Quotations from Canada Metal Co., Toronto).—

Spelter, 6.50 cents per lb.
Lead, 5¼ cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 48 cents per lb.
Copper, casting, 17¾ cents per lb.
Electrolytic, 17½ cents per lb.
Ingot Brass, 7 to 12 cents per lb.

July 9—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).—

Summerlee No. 2, $23.50 (f.o.b. Toronto).
Midland No. 1, $19.75 to $20.50 (f.o.b. Toronto).
Midland No. 2, $19.75 to $20.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

July 5—Connellsville Coke (f.o.b. ovens)—

Furnace Coke, prompt, $2.50 to $2.60 per ton.
Foundry Coke, prompt, $2.50 per ton.

July 5—Tin, Straits, 45.75 cents.

Copper, Prime Lake, 17.35 to 17.45 cents.
Electrolytic Copper, 17.30 to 17.40 cents.
Copper Wire, 18.75 cents.
Lead, 4.75 cents.
Spelter, 7.20 cents.
Sheet zinc (f.o.b. smelter), 8.65 cents.
Antimony, Cookson's, 8.12½ cents.
Aluminum, 22.50 to 23.00 cents.
Nickel, 39.00 to 40.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $47.00 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $40.50 per 75-lb. flask.

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

July 9th, 1912.

New York Curb.	Bid.	Ask.
Braden	7.00	7.12½
B. C. Copper	5.50	5.62½
Giroux	4.87½	5.00
Greene Cananea	8.75	8.87½
Inspiration	18.50	18.75
Yukon Gold	3.62½	3.87½
Goldfield Con.	4.00	4.62½
Nevada Con.	20.00	20.62½
Miami	27.50	28.00
Ray Con.	20.62½	20.87½
Chino	31.50	31.87½
United Copper	.50	1.00

Cobalt Stocks.

	Bid.	Ask.
Bailey	.02¼	.02¾
Beaver Con.	.43	.43½
Buffalo	1.45	1.50
Chambers-Ferland	.19	.20
City of Cobalt	.21	.21½
Cobalt Lake	.28½	.29½
Coniagas	.07¼	....
Crown Reserve	3.30	3.40
Great Northern	.08¾	.09
Gould Con.	.01	.02¼
Gifford	.04	.04¼
Green Meehan	.01	.01¾
Hargraves	.03½	.04
Kerr Lake	2.70	2.80
La Rose	3.25	3.40
McKinley Darragh	1.75	1.80
Nipissing	7.40	7.70
Ophir	.07	.12
Otisse	.01	.01¼
Peterson Lake	.06	.08
Right of Way	.05¼	.08
Silver Leaf	.04¾	.05
Silver Queen	.03½	.04
Temiskaming	.36½	.37½
Tretheway	.47	.55
Wettlaufer	.54	.57

Porcupine Stocks.

	Bid.	Ask.
Apex	...	[illegible]
Dobie	.15	.30
Crown Charter	.12½	.13
Dome Extension	.20	.20½
Eldorado	.02	.06
Foley-O'Brien	.15	.20
Hollinger	13.15	[illegible]
Jupiter	.26	.28
Moneta	.08	.10
Northern Ontario Exp.	2.00	[illegible]
North Dome	.25	1.00
Pearl Lake	.23	.25
Porc. Imperial	.02	.02¼
Porc. Tisdale	.02¼	[illegible]
Preston East Dome	[illegible]	[illegible]
Rea Mines	.25	.35
Standard	[illegible]	[illegible]
Swastika	.10½	.11¼
Vipond	[illegible]	.39¼
West Dome	.15	[illegible]
United	.01	.02

Sundry.

	Bid	Ask
Island Smelters	[illegible]	[illegible]
Can. Marconi	[illegible]	6.00
Amer. Marconi	7.87½	8.25

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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PROFESSIONAL : DIRECTORY.

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ENGINEERS, METALLURGISTS AND GEOLOGISTS.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

ASSAYERS, CHEMISTS AND ORE TESTERS.

BUYERS AND SELLERS OF METALS

PROVINCE OF QUEBEC

Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.

Nova Scotia Mines

Gold, Coal, Iron, Copper, Lead, Tin, Manganese, Tungsten, and other minerals.

The Gold District covers more than three thousand square miles. Millions of dollars worth of gold have been taken from the gold fields of Nova Scotia and millions of dollars worth remain for recovery.

Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

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Mussens, Limited.
Peacock Bros.
Laidlaw-Dunn-Gordon.
Canada Foundry Co., Ltd.
Walker Brothers.

Concentrators and Jigs—
American Grandal Co.
Duster Concentrator Co.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
Chalmers & Williams.

Concrete Mixers—
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

Condensers—
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

Converters—
Canadian Westinghouse.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

Conveyors—Belt—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

Cranes—
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.

Crushers—
Allis-Chalmers-Bullock Co.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Waterous Engine Co.
Chalmers & Williams.

Cyanide Plants—
Allis-Chalmers-Bullock.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.

Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers, Drafting Materials.
John Davis & Sons.
A. L. Berger.
Peacock Bros.

Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

Dredging Ropes—
Allan, Whyte & Co.

Driers—
Jeffrey Mfg. Co.
Mussens, Limited.

Drills, Air and Hammer—
Canadian Rand Co.
Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Canadian Rand Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers, Dynamo Works, Ltd.

Drills—Submarine—
M. Beatty & Sons.
Canadian Rand Co.
Mussens, Limited.

Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

Dynamite—
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Jones & Moore Electric Co., Ltd.
Siemens Brothers, Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Dynamometer—
Laurie & Lamb.

Ejectors—
Mussens, Limited.
Peacock Bros.

Elevators—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian Iron Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

Elevator Buckets—
Mussens, Limited.

Engineering Instruments—
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

Engineers and Contractors—
Smart-Turner Machine Co.
Peacock Bros.
C. L. Constant & Co.

Engines—Automatic—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co

Engines—Gas and Gasoline—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

Engines—Haulage—
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

Engines—Oil—
Jenckes Machine Co.
Peacock Bros.

Engines—Steam—
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb
Mussens, Limited.
Can. Fairbanks-Morse Co.

Engines—Traction—
E. Leonard & Sons.
Jenckes Machine Co.

Excavators.
Jeffrey Mrg. Co.
Mussens, Limited.

Fans—Ventilating—
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens, Limited.

Feeders—Ore—
Smart-Turner Machine Co.
Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.

Filters—
John McDougall Caledonian Iron Works.

Fire Extinguishers—
Mussens, Limited.

Forges—
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

Forgings—
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co
Peacock Brothers.
Canadian Steel Foundries

Furnaces—Assay—
Lymans, Limited.
Mussens, Limited.

Fuse—
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse
Canadian Explosives.
Mussens, Limited.

Gears—
Canadian Westinghouse
John McDougall Caledonian Iron Works
Smart-Turner Machine Co.
Peacock Brothers
Jeffrey Mfg Co.

Generators—
Allis-Chalmers-Bullock
Canadian Westinghouse
Peacock Brothers.

Continued on page 36.

Canadian Miner's Buying Directory.—(Continued from page 34.)

(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

Giants—Hydraulic—
Mussens, Limited.

Ground Detectors—
Canadian Westinghouse.

Galvanized Strand—
B. Greenings Wire Co., Ltd.

Girders—Steel—
Dominion Bridge Co.

Hangers—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Heaters—Feed Water—
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.

High Speed Steel Twist Drills—
Mussens, Limited.

Hoists—Air, Electric and Steam—
Canadian Rand Co.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.

Hoisting Engines—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.

Hoists—Gas and Gasoline—
Mussens, Limited.
Waterous Engine Works.

Hoisting Ropes—
Allan, Whyte & Co.

Hose—
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Rand, Ltd.
Can. Cleveland Drill Co.

Injectors—
Mussens, Limited.
Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Lamps—Acetylene—
Mussens, Limited.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Incandescent—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

Levels and Rules—
C. L. Berger & Co.
John Davis & Sons.
T. Eaton Co.

Lighting Systems—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lights—Dump—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse.

Lubricators—
Peacock Brothers.

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Mica Dealers—
Canada Metal Co.
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

Monel Metal—
Orford Copper Co.

Motors—
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

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Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Packing—
Mussens, Limited.

Paints and Oils—
Paterson Mfg. Co.

Perforated Metals—
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

Pipe Fittings—
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

Pneumatic Tools.
Can. Cleveland Drill Co.
Canadian Rand Co.
Peacock Brothers.
Jones & Glassco.

Producer—Gas—
Mussens, Limited.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.

Pulleys, Shaftings and Hangings—
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Canadian Rand Co.
Laurie & Lamb.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Pneumatic—
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

Pumps—Turbine—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.

Pumps—Vacuum—
E. Leonard & Sons.
Smart-Turner Machine Co.

Quarrying Machinery—
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Canadian Rand Co.

Rammers—Sand—
Canadian Rand Co.

Rams—Hydraulic—
Mussens, Limited.

Receivers—Air—
Canadian Rand Co.
Sullivan Machinery Co.

Roasting Plants—
Allis-Chalmers-Bullock.

Rolling Mill Machinery—
Peacock Brothers.

Rolls—Crushing—
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Roofing—
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Metallic Roofing.
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Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Rope—Wire—
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Samplers—
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

Scales—
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

Screens—
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.

Separators—
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

Separators—Magnetic—
American Grondal Co.
Wetherill Magnetic Separating Co.

Shovels—Steam—
Mussens, Limited.
M. Beatty & Sons.

Slime Tables—
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

Smelting Machinery—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.

Smelters & Refiners—
Consolidated Mining & Smelting Co.

Sprayers—
Mussens, Limited.

Stamp Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.

Steel Drill—
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Bros.
Edgar Allen & Co.

Steel—Manganese—Castings—
Peacock Bros.
Hadfield's Steel Foundry Co.
Can. Steel Foundries.

Steel—Tool—
Canadian Steel Foundries.
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Edgar Allen & Co.
N. S. Steel & Coal Co.

Steel—Structural—
Dominion Bridge Co.

Surveying Instruments—
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

Switchboards—
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Brothers. Dynamo Works, Ltd.

Tanks—Cyanide, Etc.—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.

Terminals—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Tramways—
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B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Transformers—
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Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Brothers. Dynamo Works, Ltd.

Transits—
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T. Eaton Co.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

Tube Mills—
Mussens, Limited
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.

Turbines—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Brothers Dynamo Works, Ltd.
John McDougall Caledonian Iron Works, Ltd.

Water Wheels—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works
Jenckes Machine Co.

Wheels—
Mussens, Limited.
Jeffrey Mfg Co.

Winding Engines—
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Mussens, Limited
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Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Canadian Rand Co
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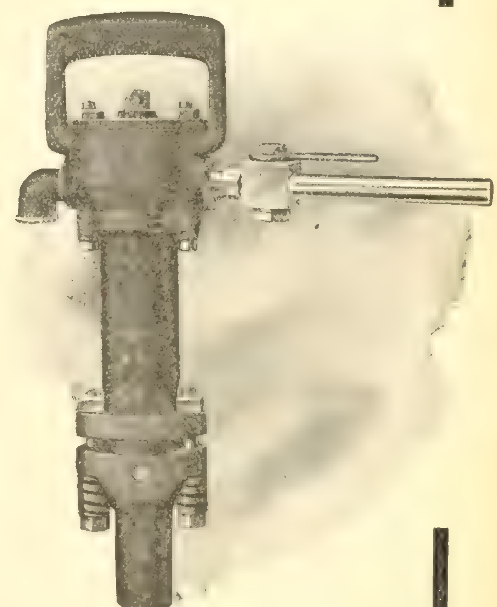

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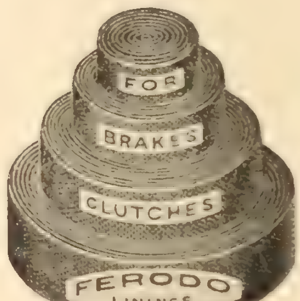

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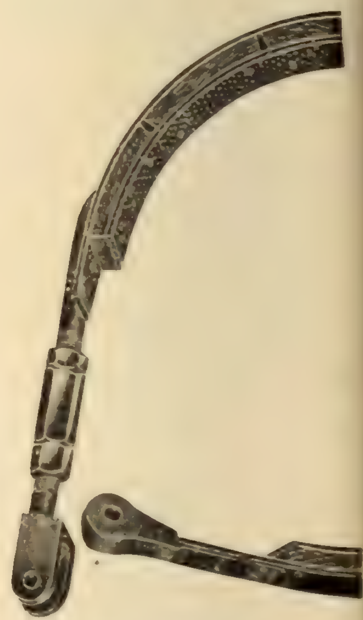

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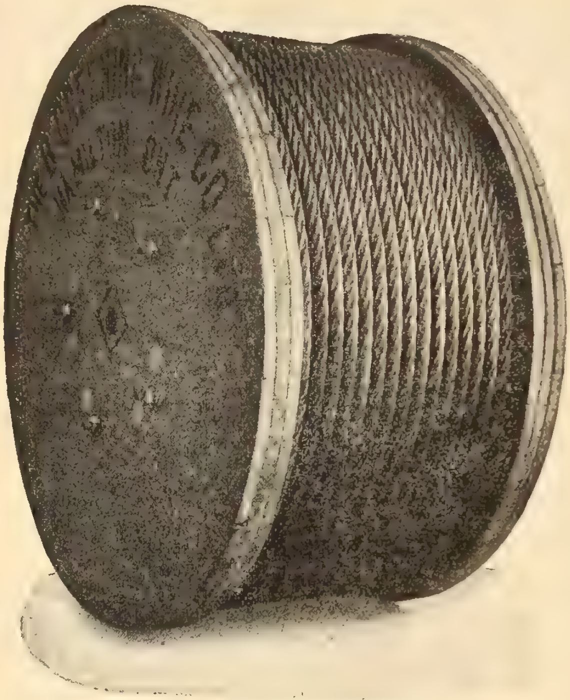

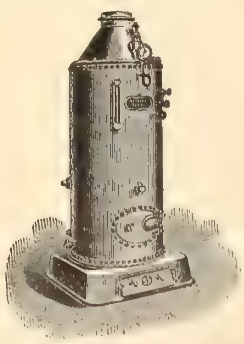

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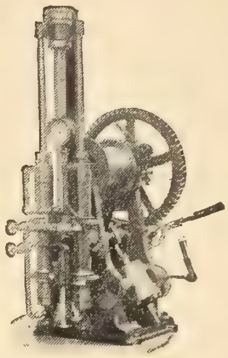

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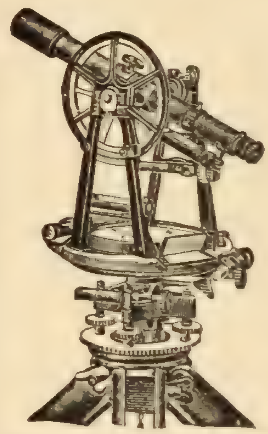

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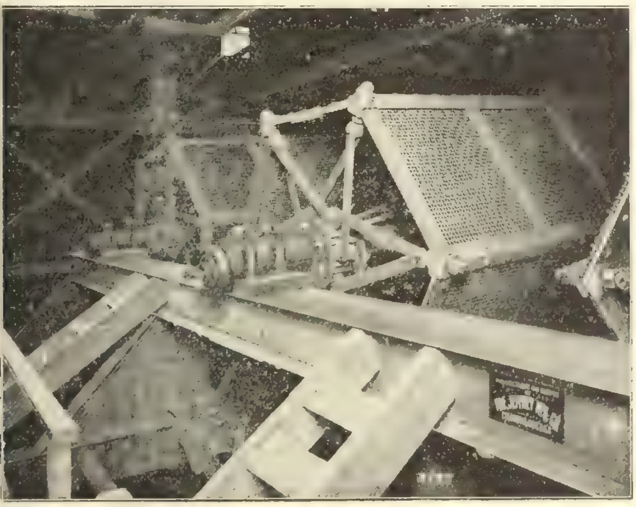

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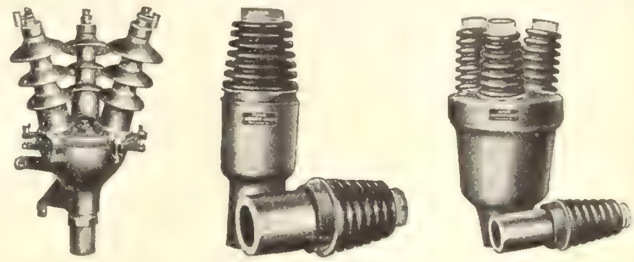

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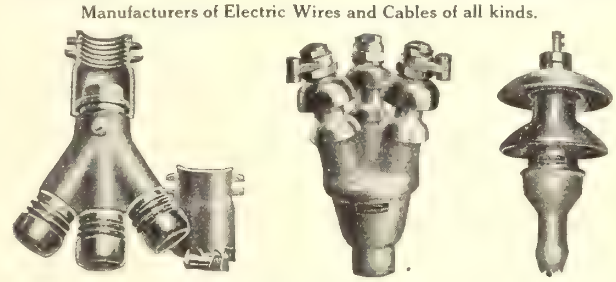

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CIRCULATION.

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CONTENTS.

THE QUEBEC ANNUAL REPORT.

The Annual Report on Mining Operations in the Province of Quebec for the year 1911 has just come to hand. Before touching upon its contents we wish to express our appreciation of the manner in which the whole report has been designed and executed. Typographically, it is a vast improvement upon any report yet issued by the Quebec Mines Branch. It is cleanly printed and well edited; and the engravings, while not perfect, are much superior to those that formerly appeared. In general apearance, in tone, and in text, the 1911 report sets a new standard of excellence. To the Minister of Mines, the Hon. C. R. Devlin, felicitations are due. Equally are they due to Mr. S. Dufault, the Deputy Minister, and to Mr. Theo. C. Denis, the indefatigable technical head of the Branch.

The Report opens with a statistical review of the annual mineral production of the Province. In value the yearly output of minerals has risen from slightly over two million dollars in the year 1899 to the respectable amount of $8,679,786 in 1911. Imperfect as the Quebec statistical methods may have been, the growth of the industry has been normal enough to give relative value to the figures quoted. Taking them as they stand, they show that Quebec's mining industry has grown 250 per cent. during the period 1899-1911. During this same period Ontario is the only province that has developed more rapidly in mining. And it is noteworthy that Quebec's expansion has been quiet and regular, with a notable absence of the costly stimulus of a boom.

The total shipments of asbestos during 1911 amounted to 102,224 tons, valued at $3,026,306, or $29.60 per ton. This compares most favourably with the previous year, when the shipments were 80,605 tons, valued at $2,667,869, or $33.10 per ton. Moreover the stock on hand was lighter in 1911 than in 1910, the figures being respectively 33,751 tons and 41,159 tons. Since the world's total production of asbestos, apart from Quebec, was in 1909 only 19,342 short tons, valued at 653,761 tons ,and as there has been no considerable increase since that year, Canada is still easily the largest factor in the market.

The shipments of copper-bearing pyrites, 38,554 tons, were larger than in any previous year save 1899. The Eustis mine, at Eustis, and the McDonald mine, at Weedon, were the only producers. At both mines the iron pyrites contains copper up to 5 per cent., and the sulphur in the ore ranges from 40 to 50 per cent.

Quebec's gold production in 1911 was inconsiderable, being only equivalent to $11,800. Practically all

of this was derived from the hydraulic operations of the Dominion Gold Fields, Ltd., near Beauceville. From recent reports this amount will be largely exceeded during 1912.

No chromite was mined during 1911. Shipments to the amount of 197 tons, valued at $2,469, were made from stock piles.

The small charcoal blast-furnace at Drummondville was the only furnace in blast during the year. Here 665 tons of pig iron, valued at $17,280, were produced.

Mica mining was considerably more active than in 1911. The total value of the mined product was $76,428, an increase of $24,527 over the year 1910.

The shipments of phosphate (apatite), totalled 595 tons, valued at $5,832. No phosphate properties were operated. The mineral was won as a by-product of mica.

Graphite mining showed a marked improvement. The mineral value of the milled product in 1910 was $15,896; whereas in 1911 the total value was $33,613, and during the current year it will probably be much higher.

The quarrying of building materials and the manufacture of brick and cement attracted considerably more attention last year than 1910. The total value of cement, lime, limestone, brick, marble and granite was 20 per cent. greater in 1911 than in the previous year. The figure reported is $4,925,401, a very substantial sum.

Mining accidents are reported upon by Mr. J. H. Valiquette, who is the Denis' assistant. 7,846 men were employed in mining and quarrying in the province during 1911. Of these, 3,686 were engaged in metalliferous, asbestos, or mica mines; and the remainder in quarries, clay-pits, and brickyards. Only four fatal accidents were recorded—three in the asbestos mines, and one in a stone quarry. Taking 3,686 as the number of men employed in mining proper, the proportion is 0.77 per thousand employed; while for the men employed in stone quarries and clay pits the rate of fatalities is only 0.24 per thousand. The corresponding figures for 1910 were 2.26 and 1.14 respectively. Thus the showing for 1911 is remarkably satisfactory. Mr. Valiquette ascribes the low rate partly to luck, and partly to improved methods of handling, using, and storing explosives.

A report by Mr. Valiquette on the stone quarries being operated in the vicinity of Montreal, a description by Prof. E. Dulieux, of some titaniferous iron ore deposits on the north shore of the Gulf of St. Lawrence, a report on the magnetic sands of the same region also by Prof. Dulieux, and a report on the geology of the Keekeek and Kewagama regions by Dr. J. Austen Bancroft, are comprised in the volume.

It is patent that the Quebec Mines Branch is doing its utmost to collect and disseminate information as to the mineral resources of the province. The Annual Report is in itself the best kind of evidence that the branch is alive to its duty. It is quite out of the question, however, to suppose that Mr. Denis, with one assistant, can do all, or half, of what is needed. The Government should have no hesitation in giving their hard working Superintendent of Mines an adequate staff.

CANADIAN MICA.

Mr. Hugh S. de Schmid, an official of the Mines Branch, Ottawa, is the author of a new monograph on Canadian mica. This publication takes the place of Mr. Fritz Cirkel's "Mica: Its Occurrence, Exploitation, and Uses," issued seven years ago. Using the same title, and purporting to be a second edition of Mr. Cirkel's work, Mr. de Schmid's volume is fuller and more comprehensive than its predecessor.

The value of Canadian mica produced in 1910 is estimated at $143,409. More than one-third of this total is to be credited to the Lacey mine, Sydenham, Ont., owned and operated by the General Electric Company. The remainder is mined in small quantities by numerous private operators, mainly in Quebec. The peculiar conditions that obtain in the mica market offer inducements only to the small investor.

The report under consideration covers amply the whole field of mica mining in Canada. Mr. de Schmid's analysis of the situation is timely and suggestive. We shall mention here certain conditions that limit the industry.

During his tour of the mica districts three years ago, Mr. de Schmid visited 250 prospects and mines. Of these, 213 were not operating, 138 had not been worked for two years. It is quite obvious, of course, that the majority of these mines and prospects can be worked only on a small scale, and are profitable only when the market is active. Hence the business is carried on sporadically. The operator who can afford to store his mica waits for the market to improve. The prospector who depends upon immediate returns, works only when he can sell at a profit.

The average cost of mining and preparing one ton of thumb-trimmed mica is estimated by Mr. Cirkel at $179. This figure does not include charges for prospecting and exploring; but it is probably exact enough to provide a fair basis of computation.

The value of Canada's annual production of mica is, roughly, $150,000, this estimate being made at the mine. The export value is about twice this sum. The stated price per hundredweight ranges between $19 and $59. But, owing to the lack of systematic grading, the market is unsatisfactory, both to the Canadian shipper and to the purchaser. Hence there is given the Indian mica an advantage that need not necessarily obtain.

Ottawa and Hull are the centres of the Canadian ca trimming industry. Twelve establishments, each iploying from 15 to 150 persons, turn out various ca products. By far the greater part of the output .shipped to the United States. Several considerable rtunes have been realized in this department of the isiness, but there inheres to it the same uncertainty at marks the actual mining of the mineral.

The lack of definite grading, and the absence of andardized methods appear to be potent factors in stricting the development of the Canadian mica in-istry. While, no doubt, mining will always be carried ı in the present method, yet much improvement is eeded in marketing the prepared material.

Mr. de Schmid's report gives the reader a full and ıbiased accounted of the whole industry. It is par-cularly suggestive and instructive.

"LAME DUCKS."

Some time ago we had occasion to refer to some ıperfluous comments on Cobalt that appeared in a oronto publication. These comments were based pon the diminishing ore shipments from Cobalt. The ıct that more silver is being mined and milled was uite overlooked, and Cobalt was spoken of as a dying amp.

This, of course, is transparently wrong. Cobalt is till in its vigorous youth, and is entering into a phase hrough which every mining camp of its kind passes. Iany of the reported failures are being handled suc-essfully by leasing operators. Not a few dead mines ıave come to life, and practically all the older mines .re in sound shape.

It is totally unfair to deal in figures without under-tanding their true meaning. The gross capitalization of all companies organized to operate in Cobalt is an normous total. Also it is absurd to debit this total to he camp. Dozens of the companies incorporated never got past the paper stage. Others were promotions with-out any sound basis. The real test, the test that Cobalt responds to, is that of dividends on invested capital.

Porcupine is suffering from exactly the same kind of criticism as has afflicted Cobalt. Recently lists of thirty or forty defunct or moribund companies have been published. Not only is this newspaper comment un-fair, but it is also mischievous in the extreme. At least ten or twelve of the companies mentioned have a good chance of life. That chance is not improved when the mines are given a public burial.

It is high time that the irresponsible mining critic were given his quietus.

THE VALUATION OF MINING PROPERTIES.

At a recent meeting of the Mining and Metallurgical Society of America, in New York, an interesting discussion was provoked by an address by Mr. J. R. Finlay on the above topic. Mr. Finlay said that in their conception of the value of mines, mining engineers had, he supposed, been largely influenced by the views of Mr. H. C. Hoover, who considers that a mine is a limited deposit of valuable ore, and that this ore should be extracted as rapidly as possible in order to realize the greatest profit. Herein the chief factor is that of the time-value of money; not only the money represented by the investment, but the money to be returned by the investment. Hence, Mr. Finlay remarked, it would follow that the true interest of the mine owner is not to perpetuate an income, but to complete a job; not to prolong the life of his mine, but to shorten it by exhausting all profitable ore and getting the money into something else just as soon as economy permits. In other words on the Hoover theory, good economy demands that the ore reserves be ruthlessly slashed by getting out the best ore first, in preference to poorer ore, there being no logical reason why any absolute profit should be sacrificed in order to make a showing of stability. These conceptions, he said, are rather shocking to the average investor, with whom stability of earning power are a sort of fetich. Hoover's style of reasoning, however, is strictly for mining men, or at least for men in a position to appreciate the real facts about a mine. Moreover, it was proposed in the first instance to apply to gold mining alone—a form of enterprise from which some of the ordinary commercial factors have been eliminated since gold can always be marketed without limit at a fixed price. The mere annual income of a mine may mean very little in the problem of estimating its total value. The engineer requires to know the facts about the ore; how much profit is already assured and how much is the ultimate possibility. It then seems reasonable to believe that the real value of a mine lies between a certain minimum and a certain maximum. The speaker did not see any reason why a mining engineer should not expect to understand commercial facts, and he, therefore, proposed to point out the great importance of strictly commercial data. There are, for example, instances in which strictly commercial questions, such as the price of a commodity or the value of money, or perhaps the mere demand for securities, or the value of some commercial strategic point, may outweigh the importance of the ore reserves . A mining engineer may be quite at a loss as to how to weigh some of these facts. Thus undeveloped mineral lands must be valued exactly as unused real estate is valued, namely, at so much an acre, according to the prices fixed by mere trading. There is apparently no other basis. In the case of mines that are going concerns, the factors are assumed to be: (1) The average cost of the product. (2) The average price of the product. (3) Variations introduced by temporary fluctuations in prices. (4) The general tendency of prices in the long run. (5) The expected life of the mine. (6) The interest rate on invested money. Of these factors scarcely one may be fixed with exactness. Of them the one generally considered to be the most difficult

to determine, is the one determinable with the greatest exactness. This is the amount of ore in a mine. The average cost is not easily determined; the other factors are so uncertain that no two men will agree concerning them. Mr. Finlay concluded: "Even past averages of prices apply only to a given term of years, and for each separate term you will get a different average. To project calculations into the future from this unstable base line is dangerously near pure guess work. What I think we sometimes forget is the enormous importance of the guess. In innumerable cases a difference of ten per cent. in the price of the product will make more difference to the value than any possible uncertainty about the life of the mine. This applies to every kind of mine except a gold mine. I have a case in hand now, a very important mine earning well over a million dollars a year. It is surely good for ten years' life, and I believe it is good for twenty years. If it lasts twenty years this mine will be worth, say, $12,000,000; if it lasts only ten years it will be worth $7,500,000. If, however, the price of its ore falls 11 per cent., it will be worth only $7,500,000 if it lasts the full twenty years . If, on the other hand, the price rises 11 per cent., it will be worth well over $10,000,000 with ten years' life. The differences in the price are no more than two men might readily disagree upon. It is a difference for example, about equal to that between 13½c. copper and 15c. copper. How often do we stop to consider these most evident facts? Here is a little difference, well within the possibilities which is more important than six or seven millions of mighty good ore. There are a number of other variables . . . . . . My point is, however, that in trying to place values upon mines we should be very cautious not to overestimate the importance of purely technical information. In the discussion that followed, Mr. Robert Peele said that he had constructed a curve of copper prices from 1861 to date and the variations were so great, and apparently there was so little system in the ups and downs of the curve, that he would consider it impossible to predict what the future might bring forth. Mr. E. G. Spilsbury remarked that in making a valuation of a mine an engineer could not arrive at figures that would take into consideration fluctuation in the market prices of metals. He can assume a certain price and then make it clearly understood that profits will fluctuate with the value of the products. Mr. H. S. Munroe pointed out that the question of the price of metals is not to be solved by a study of averages or from curves of past prices, but is determined by economic laws, which are founded upon a very large number of varying conditions, but few of which can be predicted with any certainty.

Mr. W. R. Ingalls remarked that if an engineer is examining a mine on behalf of people who are going into it as a speculation, he might, perhaps, estimate the profits at prices within a considerable range; in the case of copper from (say) 12 to 17 cents; and lead or spelter similarly. If, however, he were valuing a mine on behalf of bankers who contemplated lending money on the security, a more exact valuation would be necessary. The engineer valuing mines must necessarily be something of an economist.

EDITORIAL NOTES.

Mysterious are the vagaries of capital. The Colonial Nickel Company, shockingly soon after birth, has been absorbed by the International Nickel Company. Just who used the gun is not certain.

The Rigaud-Vaudreuil Gold Fields Company reports $20,900 as the result of the June clean-up.

Where the carcass is there will the vultures be gathered together. This is fittingly illustrated in the case of the liquidation of the Electric Steel Company of Canada, at Welland. The receipts were $3,899, and the expenses $3,689, thus leaving a balance of $210 for division among the creditors. The liquidator received for his services $447.15; the legal and court fees represented the major part of the pickings. The dividend was based on a rate of .003305 on the dollar; but no creditor was paid less than one cent on his claim. To some this must have been consoling.

SILVER.

Cyanidation-Amalgamation.—In the Mining Journal for June Mr. T. A. Rickard records some of his observations obtained on the occasion of his recent visit to Northern Ontario, as the guest of the Canadian Mining Institute, by an account of the cyanidation-amalgamation practice at the Nipissing Mines. The description is characteristically concise, and, rather than attempt an abstract, we have ventured to re-print the article virtually in extenso. Mr. Rickard writes:—

"The high-grade mill, in which is treated the picked ore taken from a celebrated mine in Cobalt. This ore, containing native silver and argentite, together with the arsenides of Cobalt and Nickel (6% Ni., 7 to 8% Co., 49% As.), after being crushed to 70-mesh at the sampler is, delivered to the plant with an average content of 2,600 oz. silver per ton. It is fed to a Krupp tube-mill, 20 ft. long by 4 ft. diameter. The charge consists of 3½ tons of ore, 4½ tons of mercury and a 5% cyanide solution. The tube mill is closed at both ends. Air, to accelerate chemical action, is introduced through a pipe. There is also an ingenious device whereby the excess of air is subsequently expelled. After nine hours in the tube mill 98% of the silver has been extracted from the ore, which, in the form of pulp then passes to a settler, where the amalgam is separated by gravity. Thence it goes to a clean up pan and drainers. These last are canvas bags for removing any excess of mercury. Meanwhile the pulp and solution, deprived of amalgam, passes to a vat and is fed to Butters filter, the clarified solution going to boxes in which the dissolved silver is precipitated on zinc shaving. This shaving is in the form of a coarse wire necessary on account of the strength of the cyanide solution. The residue left on the filter is stored, being valuable for its arsenic, nickel and cobalt. As yet no method has been devised for eliminating the arsenic in

th residue with a view to marketing the nickel and ·c alt.

Meanwhile the amalgam, containing 80% mercury 20% silver, is placed in retorts, each of which ds 450 lbs. After the mercury has been distilled silver, still containing 1% mercury, is taken to a erberatory furnace. Here it is melted in a charge 25,000 ounces. After 15 hours' exposure to a hot dizing atmosphere, without addition of any flux, t molten metal is cast in ingots, each weighing 1,100 o silver, which is 999 fine. Two oil-burners afford the essary heat. The flue from the furnace is provided h a water-jet condenser, whereby 1,000 to 2,000 unds mercury is arrested monthly. The gases ape at 100 degrees F. While I was collecting se data, a small melt was about to be finished, and I s able to see the bath of molten metal before it was ped into the rows of ingots. During February,),000 ounces of silver were melted in this small plant.

"The richness of the mine product under treatment l the completeness of the metallurgical operations t a vivid impression. Within a small building it was ssible to watch the successive stages by which a com- x ore of a refractory type yielded its precious con- t in metal of such purity as to be ready for the nt. The entire process is so expeditious that the ver is delivered at New York within a week of the y when the ore is received at the mill and a cheque the yield is received concurrently with the ship- nt. No less than 20 tons of mercury is in use at a ven time. The cyanide has a cleansing action upon indeed, the use of mercury would be impracticable thout the cyanide, for the mercury would become ck' or fouled, so as to hinder amalgamation with the ver in the finely-ground arsenical ore. The yoking syanidation and amalgamation constitutes another markable feature. To the practical man, however, e most memorable note is the fact that a consignment ore is turned into negotiable paper within seven ys. It remains to add that Charles Butters devised e process and that James Johnston designed the plant r the Nipissing Mines Company.

"It is planned to erect a mill, embodying a similar ocess for the treatment of dumps, which contain ,000 tons of ore assaying 22 ounces silver per ton. he picked stuff will go to the mill above described and e remainder to 40 stamps, four tube-mills, a Butters ter, a Merril press, with smelting of the precipitate in small blast-furnace."

GOLD MINING IN THE TRANSVAAL.

An extremely interesting and concise account of gold ining in the Transvaal is contributed by Dr. F. H. latch to the current issue of The Engineering Maga- ine. Since 1885, when gold was discovered in the Vitwatersrand the goldfield has produced gold valued t over $1,105,000,000, while the production last year epresented $170,487,900, or more than double that of he United States, and nearly treble that of Australia. 'he gold is found in a series of conglomerates, locally nown as bankets, of the Witwatersrand system, con- isting of a group of sediments some 20,000 feet thick, eparated by a great unconformity from the old schists nd conglomerates of the Swaziland system beneath it. The "Main Reef Series" of conglomerates has been worked for its valuable gold content, more or less continuously, for a distance of 46 miles. The most individualized bed, especially in the central portion of the Rand is the Main Reef Leader, one of the members of this series. Usually it is of small thickness, but has a comparatively high gold content. An important constituent of the banket is secondary quartz, which has been responsible for widespread sitification, while, in like manner, iron pyrites has caused an extensive pyritisation. This is of both scientific and economic interest, since the gold is in intimate association with and in genetic relation to this mineral. When graphitic carbon is present there is also an intimate relation between it and the gold. Gold is also found in the secondary quartz. Dr. Hatch points out that without doubt the gold has been precipitated in the banket at various periods in its history; yet there is no case on record of a nugget or of a grain or flake of gold which bore on its surface any signs of detrital origin or in any way resembled alluvial gold. It is concluded, therefore, that the gold owes its present position in the banket to precipitation at some period long subsequent to the sedimentation of the conglomerate. The gold content of the banket varies, but the average graded worked by all the mines last year was $6.80. The mines are divided into three classes, namely, (1) Outcrop, (2) Deep Level, (3) Second Deep, or deep deep. The outcrop mines follow the banket down on the dip (average 30 degrees) with incline shafts. The deep level mines sink vertical shafts, which cut the banket at a depth of about 3,000 feet from the surface; the shafts are then turned off on the incline. In respect of milling practice, two important modifications are noted: In some of the new mills the amalgamating tables are assembled, together with the precipitating boxes for the cyanide solution in a reduction house, in which the tube-mill and enriched cyanide solutions are pumped. This enables an increase to be made in the running time. Since the stamps have not to be "hung up" while the plates are being dressed. Again, stamp duty has been enormously increased by the coarse crushing practical and by "by-passing" the fines direct from the rock-breakers to the tube-mills. The weight of individual stamps has also been increased. Thus, at one mill the stamp of 2,000 lbs. is instanced. In conclusion, Dr. Hatch states that while the grade ore mined is diminishing, the annual tonnage crushed is increasing. The gold costs $4.30 per ton to produce, and since the average value of the ore is about $6.80, the average profits are about $2.50 per ton. Respecting the continuation of the gold-bearing banket at depth, Dr. Hatch remarks there is no doubt, and on the assumption that the mines will be worked to a vertical depth of 6,000 feet, and on the development of the new gold-bearing ground at both the eastern and western extensions of the banket, he estimates the continuance of a large gold yield from the Transvaals for a further period of at least thirty-five years.

OBITUARY.

A despatch from Nelson, B. C., announces the death which took place on the 4th July, as a result of a motor accident, of Mr. E. G. Warren, general manager of the B. C. Copper Company, Greenwood, B. C. Mr. Warren was born at Hawkesbury, Ont., in 1874, and graduated from Toronto University in 1896.

THE UNIVERSITY OF TORONTO AND THE MINERAL INDUSTRY

By H. E. T. Haultain.*

(Part II.)

Mineralogy is the science of minerals, and geology is the science of rocks. The basis of the mineral industry is minerals and minerals are found in rocks. Hence, to the popular mind the syllogism is complete; the shortest step is to go to geology and mineralogy for that enlightenment and for that philosophy which will aid the mineral industry. Thus the two handmaidens of the profession of mining engineering are mistaken for the mistress.

In 1856, Dr. E. J. Chapman was appointed Professor of Mineralogy and Geology in the University of Toronto and, at that time, the University stamped its approval of the teaching of mineralogy and geology in advanced education.

The first curriculum of the S. P. S., published in the prospectus of the first session, 1878-79, was as follows:—

(1) DEPARTMENT OF ENGINEERING.

This course is intended to qualify students to prosecute the various professional branches of engineering. During the first two years the course is for the most part common to the students of all three branches (Civil, Mechanical and Mining Engineering). In the course of the second year, however, the student is required to select such one of the three branches which he intends to specially pursue, and the studies of the third year are arranged in conformity therewith.

Subjects of the First Year.

1. Mathematics—Including Plane Trigonometry and Analytical Conic Sections.
2. Mechanics—Elementary Statics and Calculations of Framed Structures.
3. Drawing—Free-hand, Linear and Elementary Projection.
4. Surveying—Chain and Compass. Plotting from Notes.
5. Construction—General Principles and Foundations.
6. Elementary Chemistry.

Subjects of the Second Year.

A.—Common to all Three Branches.

1. Mathematics—Differential and Integral Calculi and Spherical Trigonometry.
2. Drawing—Free-hand and Descriptive Geometry.
3. Physics—Statics and Dynamics, Hydraulics and Optics.
4. Mensuration.
5. Elementary Mineralogy and Geology.

B.—Special Subjects For Each Branch.

Civil—
- Geodesy and Astronomy.
- Surveying-theodolite, Level, etc.
- Construction, Roads and Railways.

Mechanical—
- Machinery.
- Designing.

Mining—
- Crystallography.
- Palaeontology.
- Determinative Mineralogy.
- Blowpipe Analysis.
- Surveying.

Subjects of the Third Year.

Civil—
- Surveying—Railway and Canal Surveying, Hydrography.
- Free-hand Drawing.
- Applied Mechanics—Resistance of Material Structures in Stone. Wood and Iron.
- Hydraulics—Water Supply, Drainage.
- Mineralogy—Determination of Minerals. Minerals of Ontario.
- Metallurgy—Manufacture of Iron and Steel.
- Construction—Bridges, Canals and Harbours.
- Steam Engines.
- Experimental Physics.
- Designing and Estimates.

Mechanical—
- Physics—Mechanical Theory of Heat.
- Free-hand Drawing.
- Applied Mechanics—Resistance of Materials. Structures in Stone. Wood and Iron.
- Machines—Proportions and Parts.
- Motors—Steam and Hydraulic Engines, and Pumping Machinery.
- Mineralogy—Determination of Minerals. Minerals of Ontario.
- Metallurgy—Manufacture of Iron and Steel.
- Experimental Physics.
- Designing and Estimates.

Mining—
- Assaying and Ore-dressing.
- Crystallography. Geology and Palaeontology.
- Mining—Geology.
- Mining Processes Employed.
- Mining Machinery.
- Motors—Steam and Hydraulic Engines, and Pumping Machinery.
- Metallurgy.
- Chemistry.
- Experimental Physics.

From this it will be seen that elementary mineralogy and Geology took their place in all branches of engineering in the first year and the Determination of Minerals and the Minerals of Ontario in the third year.

In addition to the course in Mining Engineering there was a department apparently more closer to the mineral industry.

(2) DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this department the student is fully prepared in all the methods of analysis necessary to render him a competent assayist. He is also qualified to survey and report upon the value of mineral lands.

Subjects of First Year.

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics, Hydraulics.
3. Inorganic Chemistry.
4. Elementary Biology.

*Professor of Mining Engineering in the University of Toronto.

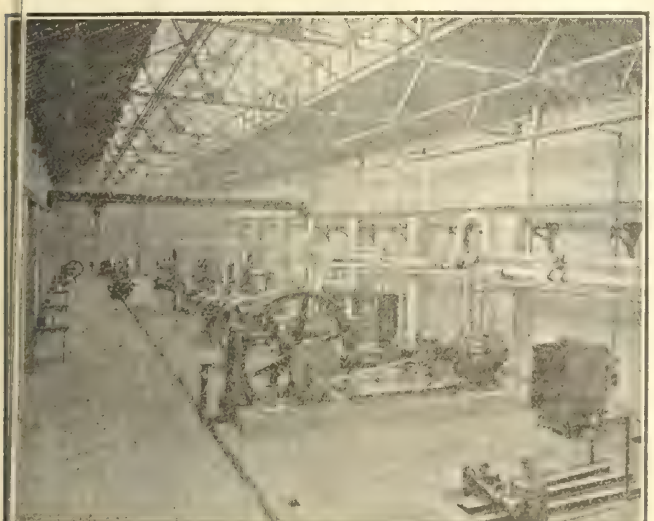
5. Elementary Mineralogy and Blowpipe Practice.
6. Physical Geography, Palaeontology and Geology.
Drawing.

Subjects of Second Year.

Higher Mathematics, including Spherical Trigonometry, etc.
Chemistry, with laboratory practice in Qualitative Analysis.
Blowpipe Analysis and Determinative Mineralogy.
Geology and Economic Minerals of Canada.
Surveying and Levelling.

Subjects of Third Year.

Quantitative Chemical Analysis.
Metallurgy.
Assaying.
Study of Metallic Veins and Other Mineral Deposits, Mining Calculations, Examination of Mineral Lands.



Thermodynamics Laboratory

It is to be noted that, after this course, the graduate is alleged to be qualified to report on the value of mineral lands, a fallacy from which we are now trying to escape.

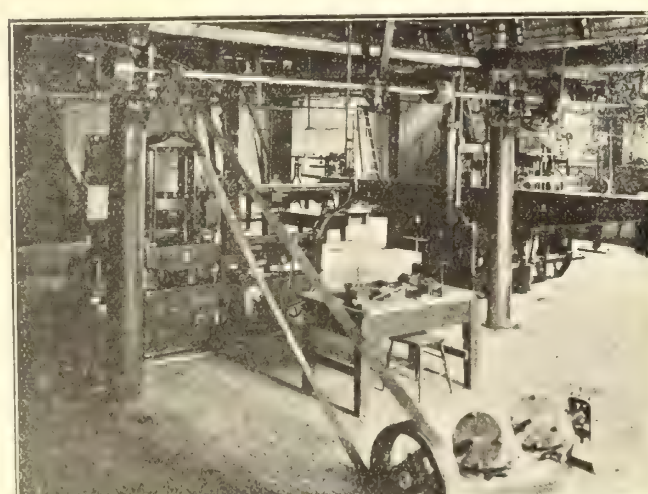
This curriculum in Assaying and Mining Geology remained practically without change until it was abandoned in 1892. In fact the only change that was made appears to have been the substitution of the word "assayer" for "assayist" in 1882. I can find no record of any student having graduated in this course.

In 1892, Mining Engineering, which for several years had been included as a sub-division of the Department of Civil Engineering, appeared as a separate department. The work of this new department differed from the course in Civil Engineering chiefly in the addition of more Chemistry, Mineralogy and Geology, together with some Mining Metallurgy, Ore-dressing and Assaying. Drawing and some other subjects were squeezed, and Hydrographic-survey and Drainage, Sewerage, etc., were dropped to make room for the mining subjects. At this time, also, was instituted an additional and optional fourth year leading to the degree of B. A. Sc. which has been referred to in Part I of this series. For the students in Mining Engineering the subjects of study in the fourth year were Mineralogy, Geology, Metallurgy and Assaying. In connection with this it is interesting to note that there was at this time no professor or lecturer in mining, but there was a professor of Mineralogy and Geology, and a professor of Metallurgy and Assaying, the latter of whom became professor of Geology at a later date. In regard to the details of the curriculum and the amount of time devoted to the different subjects the Calendars are not explicit or specific until a later date; but apparently this curriculum remained much the same for many years, there being from time to time, some increases in the work in Mineralogy, Geology, and Chemistry.

It is of importance to note that in the third year curriculum under the heading of Mineralogy and Geology the sub-divisions are, Economic Geology, Palaeontology, Blowpipe Analysis, and Determinative Mineralogy, **Metallurgy, Mining, Ore-Dressing, Assaying** (the italics are mine); and these four last subjects remained classified in the Calendars under the heading of Mineralogy and Geology for ten years or more. As further evidence of the relative position of men and subjects there appears in the Calendars from 1896 a classification of subjects and instructors from which this is taken.

Subject.	Instructors.
Mineralogy and Geology Paleontology Metallurgy and Assaying Mining and Ore-dressing Milling German	A. P. Coleman, M.A., Ph. D, Professor, G. R. Mickle, B.A., Lecturer. * * * * Demonstrator.

The calendar for the session 1891-92 states that a lecturer in Mining Engineering was to be appointed before October 1, 1891. Apparently this idea was dropped for the time and A. P. Coleman, M.A., Ph.D., was appointed Professor of Assaying and Metallurgy on the staff of the Faculty of the School.



Strength of Materials Laboratory

In 1894 Mr. G. R. Mickle was appointed lecturer in Mining and for some years gave his time for part of the session only.

In 1901 the title of Dr. A. P. Coleman was changed to Professor of Geology. In 1902, T. L. Walker, M.A., Ph.D., was appointed Professor of Mineralogy in the Faculty of Arts of the University. In 1905 Mr. G. R. Mickle was appointed Professor of Mining. In 1907, W. A. Parks, B.A., Ph.D., was appointed Associate Professor of Geology. In 1908 Professor Mickle resigned to take up the position of Mines Assessor with the Ontario Government, and I was appointed Associate Professor of Mining which title was changed to Pro-

fessor of Mining Engineering in 1910. Mr. Geo. A. Guess was appointed Professor of Metallurgy in January, 1912.

Professor Chapman had established blowpipe and assaying laboratories at an early date and also collections of minerals and geological specimens. In 1896 a stamp mill and ore-dressing appliances were installed, along with roasting furnaces and other metallurgical apparatus. Ten years later the fine, large Chemical

The Milling Building

and Mining building on College street was built. In this Professor Mickle had secured excellent accommodations for assaying laboratories, seven rooms in all, a large room for a metallurgical laboratory, and a fine separate building, seventy feet square, to accommodate the machinery for the mechanical treatment of ores. This was a magnificent step forward and the very greatest credit is due to Mr. Mickle for securing it.

I have dealt with the history of the staff and with some phases of the curriculum, and have touched on the

Electrical Engineering Laboratory

growth of the laboratories. I should like to deal at length with the history of the time table and the subdivision of the work of the session among the different subjects.

This is a matter of very serious import. The most difficult result to achieve and at the same time the most important, is a proper balance of subjects. In the School this phase of the problem has been considered paramount. There have been many optional courses, but each course has been carefully balanced in its entirety by those in control. The student can take his choice of courses but he cannot take his choice of subjects. The engineer must be essentially a man of balanced education. This can very easily be understood when we consider what the effect would be if the subject of mathematics were allowed to run to extremes, if the academic mathematics were developed, not to the exclusion of the practical applications, but to such an extent as to destroy the rational perspective. A true perspective is probably of more importance to the young engineer than the inclusion or exclusion of some valuable practical subject. I believe that the great strength of the School has been in the balance attained in its Engineering courses, more particularly in Civil Engineering. The course in Mining Engineering seems to have been somewhat out of the fold and to have travelled by itself, and there has not been preserved to it the balance that obtains in the other courses. The Calendar of 1908-09 gives the course in Mining Engineering as follows:

SUBJECTS OF INSTRUCTION.

I. YEAR.

Lecture Courses.

Algebra	Statics
Plane Trigonometry	Dynamics
Analytical Geometry	Elementary Chemistry
Descriptive Geometry	Elementary Mineralogy
Surveying	

Laboratory Courses.

Drawing	Practical Chemistry
Surveying	Determinative Mineralogy

II. YEAR.

Lecture Courses.

Calculus	Organic Chemistry
Spherical Trignometry	Optics
Descriptive Geometry	Hydrostatics
Surveying	Metallurgy of Iron & Steel
Dynamics of Rotation	Lithology
Strength of Materials	Geology
Engineering Chemistry	

Laboratory Courses.

Drawing	Practical Chemistry (Qualitative)
Surveying	Practical Chemistry (Quantitative)
Optics	Determinative Mineralogy
Photography	Lithology
Hydrostatics	

III. YEAR.

Lecture Courses.

Descriptive Geometry	Metallurgy
Surveying & Levelling	Ore Deposits
Thermodynamics	Mining and Ore Dressing
Hydraulics	Economic Geology
Electricity	Dynamic & Structural Geology
Theory of Construction	Heat
Engineering Chemistry	
Analytical Chemistry	

Laboratory Courses.

Drawing	Determinative Mineralogy
Surveying	Crystallography
Heat	Assaying
Practical Chemistry	

There was at this time no course in Metallurgical Engineering; the course in Mining Engineering was supposed to prepare for both careers. On the face of it this looks like a well balanced course, but an analysis

f the distribution of time shows as follows in the for the diploma in Mining Engineering:

alogy, including Blowpiping and Deter-ative Mineralogy and its allied sub-s of Crystallography and Petrography	162 hrs
gy	100 hrs
lurgy of Gold, Silver, Lead, Copper, kel, etc.	25 hrs
g and Ore-dressing	25 hrs

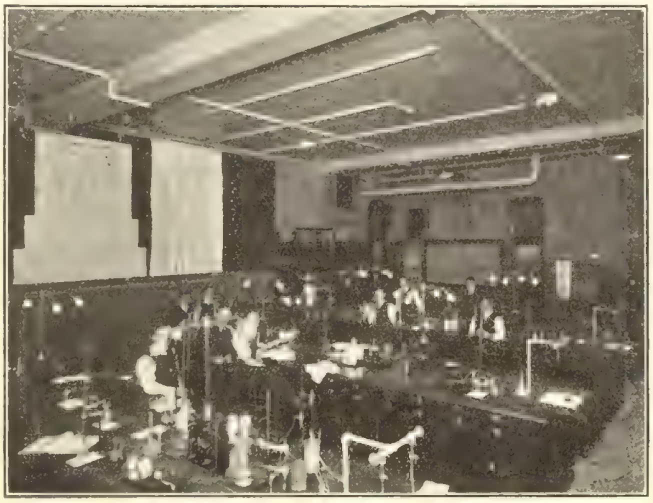
se figures represent the total time given to these ts in the complete course for the diploma.

subjects of the fourth year, which is an optional leading to the degree of B. A. Sc., are—Mineralogy eology, and Metallurgy, Assaying.

the course of three years leading to the Diploma e Department of Mining Engineering the total allotted to Mining was thirteen hours against 262 ed to Mineralogy and Geology. In the fourth of this course there was no time allotted to Min-Mineralogy and Geology divided the year with llurgy and Assaying. As a further evidence of the iar balance of things, the Calendar shows that in 09 there were in the Departments of Mineralogy Geology two professors and an associate professor a lecturer, while in the Department of Mining was only an associate professor, who was respon-also for the Metallurgy.

e Government blue book dealing with University s shows that for that session the appropriation ie departments of Mineralogy and Geology, includ-alaries, supplies, and apparatus, was the sum of $18,740; and for the Department of Mining, which includes Metallurgy, the sum of $5,004.

Mineralogy is the science of minerals and Geology is the science of rocks. The basis of the mineral in-



One of the Chemical Laboratories

dustry is minerals and minerals are found in rocks. The attitude of the University of Toronto was to look to Mineralogy and Geology for that enlightenment and for that philosophy which should aid the mineral industry.

(To be continued.)

ELECTRIC MINING APPLIANCES**

By E. A. Lof.*

ie importance of the coal mining industry of the ed States can best be realized by reference to the stics, wherein it appears that the coal production in amounted to less than 70 million tons, but in 1910 increased to over 500 million tons per year. The e of this output increased at an even higher rate, to increased operating expenses. As the mines v larger and deeper, expenses increased until, in e cases, they could not be operated profitably any ger. This led ultimately to the introduction of elec-ty for mining operations, and it is now generally eded that this system is much superior to any er. Almost all new mines are being equipped with tric drive, and a very large number of old mines changing over to this system. Not only does this uce the cost of working, but it also offers a much r and reliable operation.

Advantages of the Electric System.

single generating station can be used for feeding a ole mining district, resulting in a much improved d-factor and a corresponding reduction in the cost power. The station can be centrally or most econ-ically located with regard to water and fuel supply. ge, modern, steam-turbo generator units can be in-lled, resulting in a most efficient generation and con uity of service.

Power may also be purchased from existing trans-sion systems or available water powers may me de-oped and the energy transmitted to the mines. This ter method is now actually being carried out at some large coal fields, where the water supply at the mines is undesirable for use in boilers. If the distance over which hydraulic power has to be transmitted to the mines is not too great, a saving may also be accomplished by the use of water power, especially if a good market price is obtained for the coal, which would otherwise be consumed at the mine.

The economy with which electric power can be distributed to the various points in a mine surpasses all other methods. The electric system eliminates long and expensive steam and air lines, with which the danger of breakdown and the difficulty of keeping up the necessary working pressure increases for every extension to the service. Electric distribution, on the other hand, is most simple and flexible. Very large districts can be efficiently supplied, and additions or alterations can at all times be made without the least difficulty.

A most efficient application of motors to the different mining machines is readily accomplished. They can be direct connected, or geared to the driving shafts, thus reducing the friction losses and repair charges to a considerable extent, while, on the other hand, the cost of belting and countershafts is entirely eliminated. Individual motors can be substituted for driving conveyors, scrapers and other machinery in breakers and tipples, which formerly were equipped for group operation by means of inefficient engines. In motor-driven breakers, the saving in belting alone is considerable.

Operation with the electric system is very simple, and results in a materially increased output of a mine.

* wer and Mining Engineering Department, General Electric Co., Schenectady, N.Y. ** From the School of Mines Quarterly, Columbia University.

Perfect control is at all times possible. Simple, automatic, safety devices can be installed, and indicating or recording meters can be provided in the different circuits as desired, and the performance of every individual machine ascertained. This is a very important point, as it is possible to maintain the machinery in the best operating condition. Any excess consumption of power can at once be detected and the defect remedied, while also an accurate record can be kept of the cost of the different operations.

Both alternating and direct current are used for mining work, generally depending upon the particular conditions of the project. For smaller installations, with short distributing lines, the direct-current system can be used, the direct-current motor being well adapted for the operation of hoists, mining locomotives, blowers, etc. When, on the other hand, power has to be distributed over greater distances, as in larger mining districts with scattered shafts, the alternating-current system will generally be found more advantageous. Due to the possibility of using a higher voltage, a more economical distribution can be obtained. The simplicity of the squirrel-cage induction motor makes it especially suitable for the severe service met in mining work. The absence of slip rings and sliding contracts eliminates sparking, with the accompanying danger of firedamp ignition. For the operation of mining locomotives or other machinery requiring it, direct current can readily be obtained by motor generators or rotary converters, so that in general it can be said that the alternating-current system offers many advantages for mining work.

The advantages of electric lighting are too well known to need comment. In many mines in which the electric system has not been utilized for power, it has, however, been used for general illumination, and with the introduction of reliable and efficient miners' lamps the electric system should be still further appreciated.

Hoisting.

The electric motor affords an ideal method of applying power to hoists, due to its rotary motion and high torque characteristics. Its use for this purpose has numerous and well defined advantages as compared with steam and air systems. Complete control is afforded over the hoist when running, enabling the operator to work much quicker and with greater certainty. The ease with which brakes can be operated electrically makes it possible to manipulate the hoist with the greatest precision, the mechanical brakes being used only for holding the load. In certain circumstances, energy may be returned to the system by employing a system of regenerative braking, so designed that the weight of the descending skip may be utilized to drive the motor as a generator, and thereby feed back an appreciable amount of current into the distribution system. Power consumption is thus considerably reduced, besides obviating excessive wear on the brakes which would otherwise have to absorb the energy.

The application of steam engines to hoisting has many serious disadvantages, among others that due to the intermittent service generally required, which necessitates certain precautions in resuming the operation of a steam hoist after it has been at rest. If water collects in the cylinder, it must be thoroughly drained before starting to hoist, to avoid the danger of blowing out a cylinder head. In cold weather the operation is frequently complicated by excessive condensation, or the formation of ice. In the electric system, these difficulties are of course entirely eliminated.

Objections to air-operated hoists are numerous, and compared to them the electric system offers many important advantages besides a lower cost of operation. The number of hoists that can be served from a central compressor plant is limited, owing to the expense of piping. Extensions of an electric system can be made with less difficulty and at less expense and protective devices, insuring a safe and reliable operation are readily installed. Complicated valve mechanisms, cooling water for compressors, and reheaters for the engines, make the air system objectionable, while likewise its efficiency decreases in a very short time, due to leaky valves, pistons, and air mains, unless extreme care is taken to guard against these losses, which in turn necessarily increases the charges for repair and maintenance. The characteristics of the electric hoist motor are such that its speed is automatically limited to a pre-determined value, without the use of auxiliary devices, thus reducing to a minimum the possibility of a runaway when lowering unbalanced.

It has been estimated that the annual cost of operating an electric hoist is much less than that of an equivalent compressed-air hoist, and that the saving realized by the use of electric hoists will pay for the complete installation in from five to six years. For isolated hoists, the maximum demand of power is greater for the compressed air system. This is a very important item where power is purchased and the peak-load is penalized; here the economy in the use of an electric hoist with equalizing fly-wheel sets will be still further marked. Where compressed-air systems have been installed this fact has nevertheless generally been recognized, and the reasons for choosing the air system has been mostly a matter of first cost, in that some of the old machinery could be retained, which would not have been the case had the electric-hoist system been selected.

For driving electric hoists, shunt-wound, direct-current motors are very largely used, owing to the wide range of speed control which can be obtained economically with this type of motor. In many of the later installations, however, the polyphase induction motor with a resistance rotor control has been applied to this service with entire success; simple and thoroughly reliable controllers can readily be provided to secure the variations in speed required for mine hoisting.

Where the source of supply is alternating current as is almost invariably the case, and it is desired to use a direct-current hoist motor, a motor-generator flywheel set is generally employed as a medium. This system is generally known as the Ilgner system and employs the Ward-Leonard control driven by a shunt-wound, direct-current motor, receiving power from the alternating-current supply system through an induction motor-generator set to which is coupled a heavy flywheel. The speed of the hoist motor is controlled by varying the voltage of the direct-current generator, which is separately excited from an exciter mounted on the shaft of the set. One generator is therefore necessary for each hoist motor, although one induction motor may drive two generators. In order to permit the flywheel to take care of the peaks, and equalize the load, the speed of the set must be varied according to the demand of power and this is accomplished by an automatic regulator connected in the secondary circuit of the induction motor. In its most common form this regulator consists of a water rheostat. The resistance is varied by means of movable electrodes suspended from an arm mounted on the shaft of a small induction

motor which is set on the top of the rheostat tank. The regulator motor is connected in series, either directly or through series transformers, with the induction motor of the flywheel set. It is adjusted so that its torque opposes the weight of the electrodes, which are partly counterbalanced to reduce the size of the regulator motor to a minimum, and to permit adjustment of the regulator for different values of the line current. When this exceeds the value for which the regulator is adjusted, the torque of the motor overbalances the weight of the electrodes, lifting them, thus inserting resistance in the rotor circuit of the induction motor of the set. This causes it to slow down, and allows the flywheel to assist in driving the generator during the peak load.

Where it is desired to drive the hoist by a polyphase induction motor, the simplest system is the one in which the motor is simply direct-connected or geared to the hoist drum, without the use of any equalizing set. The motor is always of the phase-wound type and the speed is controlled by a rheostat which is connected by means of the collector rings to the secondary or motor circuit. It is generally of the liquid type on account of the heavy currents involved, and consists of a sheet-iron tank divided into two compartments; the upper contains the electrodes and the lower contains coils for cooling the salt water which is kept circulating continuously from the cooling tank to the rheostat compartment by a centrifugal pump. The resistance is varied by changing the level of the liquid in the upper tank, and this in turn is done by operating a weir or gatevalve, which permits water to flow out and lower the level if the resistance is to be increased and vice versa if it is to be decreased. The gate is manipulated by levers conveniently located for the operator.

The power taken by this system is constant during the period of acceleration, but the efficiency for this period is very low. No power is returned to the supply system during retardations, but only when lowering the empty skip, and the power consumption for small movements of the cage or skip is very large. On the other hand, the efficiency during the period when the hoist is running at full speed is high, and no power is consumed while the hoist is at rest. The efficiency of the complete cycle of operation decreases rapidly with a decrease in the time during which the hoist is driven at full speed, while it increases with an increased rate of acceleration.

With the Ward-Leonard system first described, the power consumed during acceleration is much less than with the induction-motor hoist and a considerable part of the energy stored in the revolving parts of the hoist is returned to the system during periods of retardation, and also when lowering the empty skips. When the hoist is running at full speed, however, the efficiency is lower, and it must also be taken into consideration that the losses in the motor-generator set must be supplied during the time when the hoist is at rest. It follows, therefore, that the Ward-Leonard system is more advantageous for short lifts, in which case the period of acceleration is a large percentage of the total hoisting cycle, and the time during which the hoist is idle is a minimum.

The induction-motor hoist system, previously described, is however objectionable on account of the fluctuation in the power demand, to overcome which a converter equalizer is sometimes added. Such a combination includes a rotary converter connected on the alternating current side to the supply system, and on the direct-current side to a motor driving a large flywheel. A regulator actuated by the line current controls the direct-current motor field, so that when the power taken by the hoist drops below the average, the field is automatically reduced, causing the flywheel set to speed up and absorb power from the supply system and store it in the flywheel. When the load on the hoist motor exceeds the average, the operation is reversed, the flywheel set slows down and power is returned to the system through the rotary converter.

Either of the two flywheel equalizing systems here described can be used where the supply is direct current; in the first system by substituting a direct-current motor for the induction motor, and in the second by omitting the rotary converter, but retaining the motor flywheel set.

Haulage.

The most efficient and satisfactory method of haulage is by electric mine locomotives. Actual experience has shown that the cost of hauling is from 50 to 75 per cent. cheaper by electric locomotive than by mules. A consideration of the number of mules and drivers required to perform the same work as a locomotive makes this evident.

The direct-current, two-motor locomotive is now generally recognized as the standard type for mine work. There are two general forms of this type; in one the side frames are placed outside of the wheels and in the other the side frames are placed inside the wheels. For a given track gauge, the outside frame allows maximum space between the wheels for the motors and other parts of the equipment, renders the journal boxes more accessible, and gives somewhat more space for the motorman at the operating end. The inside frame restricts the space between the wheels available for motors and other equipment, but allows for the minimum overall width—a construction very desirable in those mines where props are set close to the track, or the space outside the rails is otherwise limited. The wheels being outside the frame, in case of derailment this type is somewhat more readily replaced.

For hauling cars between the working face of rooms and the entries, gathering locomotives are now recognized as the most efficient. In general construction, gathering locomotives are similar to those for main haulage, except that they are usually lighter and are provided with cable reels. The reel is driven through a double reduction gearing by a small, vertical, series-wound motor, the reel being supported by the motor frame and turning on a ball-bearing between the main gear and the top of the motor. The reel is equipped with about 500 ft. of flexible, heavily insulated cable. The inner end of this cable is connected to a collector ring on the upper side of the reel, and the outer end is fitted with a copper hook for attachment to the trolley wire.

On leaving an entry, the cable is hooked over the trolley wire, and as the locomotive moves forward the reel motor is overhauled and acts as a series generator, its counter-torque being sufficient to produce a tension on the cable which causes it to pay out evenly, and drop along the roadbed without kinks. Owing to the braking effect of this counter-torque, the reel ceases to rotate the instant the locomotive comes to a standstill. As soon as the locomotive stars back and slackens on the cable, the motor action comes into play and the reel winds up the cable. The operation of the reel

is entirely automatic; there are no switches or shifting levers for the motorman to handle, and he is therefore free to devote his entire attention to running the locomotive.

For gangways in which the grade is so steep as to prohibit the use of the cable-reel locomotive, the combination type is preferably used. This locomotive is of the same general construction as the reel type, with the addition of a hoisting drum and steel cable, by means of which the loaded cars are pulled up the slopes and then delivered to the main tracks in the regular way. As this type of locomotive can also perform the duties of the direct haulage and cable-reel types, it is often considered indispensable in mines where a limited number of locomotives are to handle the entire output.

Mining locomotives can also, if desired, be equipped with alternating-current motors. They are of the same general construction as the direct-current locomotives and are equipped with two three-phase induction motors. Their operation requires two overhead trolley wires, with the track rails constituting the third leg of the three-phase circuit. To collect current, two separate trolleys of the standard mine type are used, these being mounted on opposite sides; but for certain conditions a double trolley, two poles on a common base, can be furnished. As the induction motor is inherently high-speed, a double gear reduction is used.

Pumping.

For mine work, two classes of pumps are generally used, main pumps and auxiliary pumps. The former are generally of the stationary type and are used for pumping water out from sumps into which it collects, either by gravity or through the auxiliary pumps. Main pumps are of either reciprocating or centrifugal type, driven either by direct-current or by induction motors. It has been the custom to use centrifugal pumps for low heads and large amounts of water, but recent practice has indicated that these pumps will operate very efficiently and satisfactorily for heads of 1,500 ft. and over. The ability with which they can handle muddy and sandy water makes them preferable for mining service, and the smaller space they occupy is well worth considering. They are readily driven by direct-connected, polyphase induction motors, thus eliminating the friction losses of a gear drive.

Auxiliary pumps for raising water from scattered points in a mine on a lower level than the main pump, are mostly of the portable type, although they may be stationary. They are generally driven by direct-current motors, fed from existing trolley circuits. Among such auxiliary pumps, the portable set is of interest. The pump and motor are mounted on a truck of the same gauge as the mine tracks, so that it can readily be hauled by a locomotive to any place in the mine and immediately put into service.

The sinking, or dip pump, may also be mentioned. This type is generally used for pumping out flooded mines. It is designed to be lowered vertically in a shaft and is either mounted on a float or is suspended from the hoisting cables, so as to float on the surface of the water. Squirrel-cage induction motors should preferably be used for these pumps, as they are liable to be entirely submerged, which however will not cause any harm as there are no collector rings nor moving contacts.

Air Compressors.

The air compressors found in mining service are, as a rule, utilized for providing compressed air for air drills. Large air compressors are generally located at some central point in the mine, from which piping is run to the various places where compressed air is required. They are generally of the reciprocating type, due to the high pressure required for drilling, about 80 lb. per sq. in. As they require a comparatively low speed, and are characterized by steady load and low starting torque, the synchronous motor is especially well adapted for driving them. The possibilities that these motors offer for improving the power factor are also of importance in their selection.

Drilling.

The problem of making a satisfactory electric rock-drill has been studied for many years, and many more or less successful devices have been invented. The latest development along this line is the motor-operated rotary-hammer drill. The mechanism of the drill consists of two parts, a revolving helve containing the hammers, and the chuck mechanism for holding and rotating the drill steel. A flexible belt connection between the motor and the drill permits a variation of speed to any desired degree, so that all the advantages of hand drilling can be obtained without the disadvantage usually incident to machine drilling. The drill mechanism is totally enclosed with a heavy cast-steel casing which protects the working parts from any foreign substance, and is of sufficient strength to withstand the severe strains to which a drill is subjected in mining service.

The striking mechanism consists of two steel hammers guided by a revolving helve. As the helve revolves the hammer is thrown outward by centrifugal force, and at each revolution strikes a blow upon the projecting head of the drill-steel cap which delivers the energy of the blow to the drill. After delivering the blow, the hammer rebounds into the chamber within the helve, where it is completely cushioned upon air which it traps. During the period of recoil the hammer passes the projecting drill-steel cap, as the helve is continuously revolving. The hammer is again thrown into striking position by centrifugal force, during the remaining portion of the revolution.

The drill steel is kept rotating by means of a heavy worm-gear reduction, driven from the helve shaft. A rugged slip-friction cone is mounted on the worm-gear shaft and serves to protect the gears from undue strain in case of a sudden sticking of the drill. When not striking rock, the blow from the hammer is absorbed by buffer plates, which also retain the steel in the chuck while backing out of deep holes in broken and uneven ground.

The motor is fully enclosed and splash-proof, capable of successful operation in wet places, and is reinforced throughout with particular reference to the requirements of rock drill service. The drills can be equipped with either direct-current or three-phase, alternating-current motors. The power required for its operation is about 1½ to 2 horsepower.

The above electric drill has been on the market for only a comparatively short time, and is not as yet extensively used. The "electric-air" drill, however has been in general use for a number of years and has proved very satisfactory. It is really an air drill driven by pulsations of compressed air created by a duplex air pulsator actuated by a standard electric motor. The air is never exhausted, but is used over and over again, playing back and forth in a closed circuit.

The drill consists simply of a cylinder containing a moving piston and a rotation device, with no valves,

ıests, buffers, springs, side rods or pawls. The cylin-er is larger, but the stroke is shorter, making the eight of the drill unit about the same as that of a cor-esponding air drill. The pulsator is a vertical, duplex, ngle-acting, air compressor with opposite cranks, but ith no intake or discharge valves nor water jackets. t is geared to a motor, either direct or alternating cur-ent, and mounted on a wheeled truck for easy hand-ng. Two short lengths of hose connect the pulsator ith the drill, each running from one pulsator cylinder o one end of the drill cylinder.

The ordinary air or steam driven rock-drill takes a ull cylinder of air or steam at full pressure at each troke, and exhausts it at practically full pressure. No dvantage, therefore, is taken of the expansive pro-erties of the air or steam. The electric-air drill, how-ver, operates on an entirely different principle. The losed system comprising the outfit is filled with air nder a low pressure, which is simply a transmitting gent between the piston of the pulsator and the piston f the drill itself. The object of slightly compressing his air is to give it a greater density for the transmis-sion of the pulsations imparted to it by the pulsator. In fact, the air in the system may be considered as a ushion between the pulsator and the drill, the pres-sure in the air simply giving the requisite tension. Practically the only loss of power is that consumed in overcoming the friction of the mechanism, as hardly any loss takes place between the pulsator and the drill.

Coal Cutters.

The cutters used in coal mining are generally of three types, the disc, the bar, and the chain type. Of these ,however, the chain type seems to be most exten-sively employed in the country. The chain is driven by an electric motor and the whole mechanism is mounted on a truck; the whole machine is automatically moved sidewise from one side of a room to the other, thus completing the cutting in one operation.

The motor is especially designed for this work, and is of the multipolar, vertical, shunt-wound, direct-current type, equipped with a ventilating fan. The armature is built on a spider, making shaft replace-ments simple and economical. The controller and the interlocking reverse switch are of ample size, mounted on a slate base. The machine is so arranged that elec-tric power can be used for unloading, moving to posi-tion at face, loading on truck and moving about the mine,, making a large saving in time and labour over other designs. By the use of an adjustable friction clutch, through which the feed gearing is operated, all danger of overstrains and breakages is removed. The power truck is unusually strong and convenient, re-quiring the movement of one lever to throw the pro-pelling mechanism in or out of clutch.

Ventilation.

The proper ventilation of deep coal mines is of the utmost importance. Fan blowers of comparatively low speed, or high-speed, low-pressure air compressors are used. For driving fan blowers, either direct-current or alternating-current motors can be successfully used. Where the distribution is by direct current, the motors can be either of the shunt or the compound-wound type, the latter being preferred for very large fans of which the starting torque is great. With an alternat-ing-current system of distribution, induction motors are often used, their advantage being their high start-ing torque and the possibility of speed variations for changing the air supply. This latter point, however, is not of great importance, as actual practice has shown that the losses in the rheostatic motor control are about the same as the losses due to a mechanical shut-tering of the fan. Where fans can be entirely shut-tered, the starting torque is not very large; and con-sidering the rather bad effect that an induction motor has on the power factor of a system, the use of syn-chronous motors is greatly preferred. Where fans are installed in remote places, induction motors would possibly be more advantageous on account of the little attention they require. If possible, the motors should be direct-connected so as to avoid the use of belting, thus insuring more reliable operation and economy in the required space.

On account of the high speed required by centri-fugal compressors, synchronous motors are not so well adapted and induction motors would be preferable for this service. Where a compressor is of large capacity and can be installed in the generating station, it may be driven by an efficient steam turbine, eliminating the generator and motor losses.

Breakers and Tipples.

The various auxiliary machines used in breakers and tipples, such as crushers, picking tables, screens, con-veyors, etc., are preferably driven by polyphase in-duction motors, either direct-connected to driving shafts or to individual machines. The absence of com-mutator troubles, due to the severe vibrations in this service, makes such motors preferable to direct-current motors. The entire omission, or reduction in the num-ber of belts formerly used in this kind of work natur-ally results in increased efficiency and consequent de-crease in operating expenses, while at the same time it greatly improves the safety and reliability of the installation.

Dredges.

While the early types of steam-driven dredges were partly successful, their operation was rendered ex-pensive by the scarcity of available fuel and the cost of handling it. With the rapid development of hydro-electric plants and large central generating stations, together with the increased distances to which electric current could be economically transmitted, it was found that the electric motor afforded a compact, easily con-trolled, and highly efficient substitute for steam drive; separate motors could be applied either directly or with short belts to the various units of the dredging mach-mery, and a larger percentage of the input power was thereby directly applied in useful work.

Where many changes were necessary in the type of motor originally applied, before satisfactory results were obtained, motor drive has indisputably proved its superiority to steam drive in cost of both power and maintenance. The modern dredge can now be sup-plied with motors especially designed for heavy duty, and capable of running continuously without danger, and requiring a minimum of attention.

The standard form of dredge used to-day is the continuous-chain, close-connected bucket type, ranging in capacity from 3 to 13½ cu. ft. The speed of the bucket line varies from 50 ft. (with 18 to 25 buckets) to 75 ft. (with 35 to 50 buckets) per minute, depending upon the condition of the ground. For the operation and control of the bucket line, a variable-speed motor is used. This is located on the lower deck and is belted to a driving pulley, which is generally situated in the rear of the pilot house on the upper deck. The duty imposed upon this motor is severe, as it must operate under conditions calling for power varying from ap-

proximately 75 per cent. overload down to 25 per cent. of its rated capacity.

To keep the dredge in place, move it about, or hold it against the bank when digging, head lines are used, being controlled from the forward end, and generally operated by a 6-drum winch driven by a variable-speed motor. The winch motor, while of smaller capacity, must be of the same rugged construction as the digger motor. It is equipped with a suitable controller and resistance to permit continuous operation at from one-half to full-load speed. It has been found advisable to equip the motors for this service with solenoid brakes, by means of which the motor can be brought to a standstill almost instantly. It is then ready for the reverse operation without the usual reversing of the motor through the controller. This latter method is bad practice, as the sudden reversing of the motor in this way causes a heavy strain on the windings, and may result in a burnout.

The high and low-pressure pumps for supplying water to the screens and sluices are generally operated by a separate motor, direct-connected to each pump. The high-pressure pump is operated by a 720 or 900-r.p.m. motor, and the low-pressure pump with a motor operating at 600 to 720 r.p.m.; each motor is mounted on the pump base and is direct-connected to the pump by a flange coupling.

For driving the primary pump, when priming the large pumps, or for supplying water on the table during the clean-up, a 10-h.p., high-speed motor, direct-connected to a centrifugal pump, will insure economy and efficiency in operation, as the motor, when used intermittently, will consume current only in direct proportion to the work done.

For the operation of either shaking or revolving screens, a constant-speed, belted motor of from 25 to 50-h.p. capacity is usually required, and is generally installed on the upper deck. This motor is similar to that operating the winch and the bucket-line, but is equipped with a small reversible controller, with sufficient resistance in the armature circuit to bring it to full speed in about one minute.

For driving the conveyor belt of the stacker, a 25 to 50-h.p., constant-speed motor, similar to the one used on the screens, is required, located at the end of the ladder, and either belted or connected by silent-chain drive.

Mine Telephones.

Pre-eminently important from the mine operator's viewpoint, in considering telephone service in a mine, is the saving of time and the facility with which orders and messages may be orally despatched to employees stationed in various departments of the workings. The savings to be effected by the use of mine telephones are numberless, and may be readily appreciated when considering the variety of characteristic accidents, such as explosions, water freshets and landslides, which make mining a hazardous business. Mine officials frankly say that the presence of this protection is worth the initial cost of the system, which is repeatedly earned by its reliable performances at just such times as those mentioned. The operation of almost every mine is dependent upon a variety of these uncertain conditions, rendering it almost impossible to anticipate a temporary suspension of work in advance of its actual occurrence. The fact that the superintendent of a mine may remain in his office and be in direct talking communication with every corner of the entire mine system at all times is of such paramount importance that it seems unlikely that any mine owner will conscientiously avoid giving this matter serious consideration.

The cost of constructing the underground line for a mine telephone system is usually less than for surface systems, because no poles are required and there are no holes to dig. A mine telephone system does not require an expert to install, and about all the work required of the mine owner is the placing of the instruments to advantage and stringing line-wire to these points. This single feature of construction is quickly done by running wires through the drifts and down the shafts on standard wood brackets equipped with common glass insulators. In a large number of mines, rope haulage is used to convey ore to the surface. Where such is the case, a metallic signal line is usually run along the side of the entry to transmit signals to the engineer, usually located at the surface. If such a condition exists, it is necessary only to connect any required number of bridging telephones to the circuit, provided by the haulage strand and the signal wire. In this case no expense is incurred beyond the first cost of connecting them at each station. The expense of maintenance is usually very light, because lines under ground are not subject to atmospheric conditions that are present outside, and trouble from lightning is, of course, unknown.

Although ordinary, iron line-wire has been used with success in some mines, the safest construction can be furnished at little additional cost by substituting rubber-covered wire for all underground circuits which are in any way subject to moisture or dampness from contact with fresh earth or with timbers. In some conditions it has been considered good practice to use lead-covered cable; providing the installation warrants the expense. In any event, this part of the equipment should not be slighted, and the best is always the cheapest. By installing cable an increased degree of certainty is assured.

Lighting.

The electric system of lighting, for general illumination, is too well known to need any comment. The problem of making a satisfactory miner's hat lamp to supersede the present oil lamp, which will always remain a constant source of danger and discomfort, has for many years been the aim of a number of inventors, and numerous designs of more or less value have been put on the market. One type, which has just been developed, promises to be a great improvement in this line.

This lamp consists of a miniature tungsten unit operated from a light, portable, storage battery. It is rated at one mean horizontal candle-power, but by an effective reflector, as high as 5 c.p. is obtained in the beam of light at a distance of 4 or 5 ft. The lamp socket consists of a hard, moulded compound, unaffected by moisture, acid or gases, which completely encloses and protects all metal parts. The steel reflector, which is enameled both inside and outside, is also supported from the lamp socket. The complete lamp is compact, light in weight, and mechanically strong. It is designed to replace the old type of oil lamp, now in general use, without any modification to the cap.

The storage battery is portable, designed to be carried either on a belt or from shoulder straps, or by a handle, as a lantern. The cell is protected by a japanned steel case with an acid-proof moulded cover. The terminals are brought out through an acid and moisture-proof receptacle, from which an armor-braided.

rubber-insulated cable connects to the hat lamp. The battery has a capacity of 10 ampere-hours, and is of sufficient size for operating á lamp 12 to 14 hours. When used as a hand lantern, the lamp socket and reflector are removed from the cap receptacle, and inserted into the réceptacle on the side of the battery.

HYDRAULIC MINING IN BEAUCE COUNTY, QUEBEC

Between the years 1875-1885 gold to the value of over two and a half million dollars was recovered from the gravels of the Chaudiere River and its tributaries. The gold-bearing area is included in a stretch of country extending for 20 miles long by 10 wide from the Des Plantes River, below the village of Beauceville, to Trout creek, above Chaudière Falls. Hydraulic operations were initiated in 1882, but were discontinued in 1884. Rather over two years ago the Champs d'Or Rigaud-Vandreuil acquired the mining rights over 72,000 acres in the Seigniory Rigaud de Vandreuil, and under the direction of Mr. Fritz Cirkel prospecting, by drilling and shaft-sinking methods, was inaugurated. The result of this work proved, so Mr. Cirkel asserts, the existence of workable gravels along the upper Gilbert River, the lower reaches of the Des Plantes River, and the lower Ruisseau des Meules creek. After due consideration and investigation a site on a lower reach of Ruisseau des Meules was selected for the establishment of plant and machinery. The equipment includes a mechanical elevator (capacity 3,672 cubic yards per 24 hours. This elevator is electrically driven, the power being generated at works 1½ miles distant, situated on the line of the Quebec Central Railway. A sluice box, the length of which is 850 feet, has also been built. The water supply for hydraulicing operations is conveyed a distance of 7½ miles from Fortier and Carter lakes, the main outlets of which have been dammed, thus providing for the storage during the summer season of 30,000,000 cubic feet of water. The elevation of the lakes in relation to Ruisseau des Meules creek is 335 feet. The ditch from the lakes to the workings in part cut through solid rock. For the first 3,200 feet the grade is 1 to 800, and for the rest 1 to 600, affording a head of 275 feet. The ditch, it is estimated, will carry 2,000 miners inches. The length of the pipe line (of wrought iron) is 2,600 feet from the penstock to the works below, and 3,500 feet to the end of the sluice box. Three giants (4-inch nozzles), one employed for driving, another for cutting, and the third for stacking tailings, are in use.

The First Run at Beauce

The gold is prevailingly confined to the gravels' beds directly overlying bed-rock. These beds range from two to nine inches in thickness and consist of a yellow sandy-clay material containing pebbles of the country rock. The beds are overlain by (in ascending order) heavy boulders, 2 feet; fine blue clay, 1 foot; glacial boulder clay, 10 to 12 feet; "bouldery" gravel, 3 to 4 feet, and. on the surface, drift-material, 10 feet. Usually the gold is concentrated near bed-rock; although nuggets ranging in value from $12 to $27 were found last year above the glacial boulder clay.

A part of the ground, notably that on which the plant is situated, is covered with tailings from earlier opera-

tions. This, notwithstanding, a trial clean-up last summer, yielded results equivalent to 37 cents per cubic yard from 2,600 yards of tailings. A second clean-up

Hydraulic Plant at Beauce

in August, 1911, from 16,600 cubic yards, representing in part tailings and in part virgin ground, yielded 42 cents per yard.

The width of the pay alluvial immediately in front of the elevator is 100 feet; at 300 feet distant, it is 16.5

Drill Prospecting at Beauce

feet; and at 1,800 feet from the elevator, as so far ascertained, the width is about 400 feet. The large nuggets hitherto found have been obtained either from bed-rock or from the gravel immediately overlying it. At the last clean-up the largest nugget recovered represented a value of $292.50, while other nuggets recovered at the same time were valued at $171.60, $98.47, $76.93, $43.39, $35.22, $30.17, and $18.16, respectively.

THE PRESERVATION OF MINE TIMBER.

The United States Forest Service has recently issued a bulletin containing much valuable information, on the above subject. Timber, as is well known, is exposed to destruction from many sources, the chief of which, however, are decay and insect attack. Natural decay may be combated. While, under certain conditions peeling and seasoning often increase the durability of timber, chemical preservatives are said to yield the better results. Before treatment, however, the timbers should be peeled, preferably seasoned, and cut and framed to their final dimensions and form. Since the sawing and cutting of treated timber will more probably leave untreated surfaces, which will be subject to insect attack. The several preservative methods are described and discussed. Of these, there is first the application of two or three coats of hot creosote or some similar preservative. This has the advantage of being tolerably effective and inexpensive; but the effectiveness is dependent on the seasoning of the wood before treatment, otherwise checking may later expose untreated portions to fungus attack. Care must, moreover, be taken that the preservative penetrates all checks, knot-holes, and covers all surface inequalities. This method is advised when there is no great amount of timber to be treated, or when it is necessary to restrict the initial cost to the lowest possible figure. The main disadvantage of the method is that the penetration of the preservative is not sufficient to insure the protection of the timber for any considerable period. A more effective, but more expensive process is that known as the "open tank method." The timber is first immersed in a tank, of suitable capacity, containing the preservative, the charge being then heated to a sufficiently high temperature to drive off a portion of the air and moisture contained in the wood. The maximum temperature, in the case of creosote oils, should not, however, exceed 220° F.; and, if an aqueous salt solution is used, should be kept slightly below the boiling point of the solution. Following the hot bath the timber is again immersed in the preservative, now at a lower temperature; or it may be left in the hot liquid, which is allowed to cool.

A third method of treatment is that of pressure, which, because of the difficulty of impregnating certain species of wood by the open tank method, is usually preferred. The essential feature of the pressure process is that reliance is placed on atmospheric pressure to secure penetration of the preservative. Woods that may be treated satisfactorily by the open-tank method are thoroughly seasoned loblolly, pitch pine and seasoned yellow pine. Heart Douglas fir is impregnated with difficulty.

In the matter of apparatus and costs, the open tank is cheaper than the pressure plant to instal, but the unit cost of handling timber is higher. The equipment in the former case merely consists of an uncovered tank provided with a device for submerging the timber. The tank may be so arranged to permit of the building of a fire beneath it, but if a supply of steam is available, the provision of coils is advised in preference. Such a plant, with a treatment capacity of 100,000 cu.

ft. may be erected at a cost of from \$1,500 to \$2,500. The cost of a pressure plant is, of course, dependent on its capacity, but as a rough guide, a plant, it is estimated, with a capacity of 750,000 cu. ft. per annum, will cost from \$12,000 to \$20,000. The cost of treating timber by the open tank method is usually from 3 to 4 cents per cubic foot; and by the pressure system from 2 to 3 cents, exclusive of the cost of the preservative, which is the important item. This latter may range from 12 cents to \$2.40 per set of timber, according to the character of the preservative employed and the method of application. Thus coal-tar creosote, the price of which is given at 8 cents per gallon if applied by brush, will represent a cost of 12 cents to the set; if impregnation methods are followed, the cost per set is increased to \$2.40. Employing avenarius carbolineum the cost for brush treatment is \$1.05, while impregnation with zinc chloride costs per set 52 cents only.

The results, among others, of experiments demonstrated (1) that the life of untreated timber was from 1 to 3 years, while that of brush treated timber was given 3 to 4 years. (2) Brush treatment with avenarius carbolineum was somewhat more effective than similar treatment with coal-tar creosote. (3) The condition of timber treated by the open tank process with sodium and magnesium chloride, although not comparing favourably with that of timber similarly treated with other preservatives, was better than that of the brush-treated timber. (4) Open-tank treaetments of green timber with zinc chloride proved fairly effective, but the tests indicate that better results will be secured with seasoned material. (5) With few exceptions, none of the impregnated timbers showed signs of decay after from 3 to 4 years' service. (6) Mine timbers impregnated with zinc chloride and creosote oils have given the best results, and so far no difference in their durability has been noted. It is concluded that not only will proper preservative treatment result in a direct saving in money, but less timber will be required for any given working. Furthermore, the use of treated timber makes it possible to utilize many of the inferior, and more rapid growing species, which, while possessing most of the requirements of high-grade structural timber, lack durability. For treated timber of these species has in many cases proved more serviceable than high grade untreated material. Thus in our own provinces of Alberta and British Columbia, Douglas fir which is now extensively used, may be replaced by treated hemlock, larch, or western pine, the higher grade timber being thereby conserved for purposes to which it may be utilized to greater profit.

CORNISH TIN MINING

(From a London Correspondent.) London, July 6th, 1912.

The tin mines of Cornwall are famous all over the world, and it is an oft-told story of how the industry goes back to the Roman times. It was, however, in the sixteenth century that the first charter was granted to tin-getters and the mineral has been got out continuously ever since. Copper is also found, and figures show that from 1726 to 1855 the copper ore produced in Cornwall and the sister county of Devon realized over \$250,000,000. Some silver has also been won. The names are recorded of more than 1,600 Cornish mines that have been worked at one time or another. Just when the industry appeared to be on the verge of extinction the big rise in tin started. Many of the old mines were revived, and fresh capital poured in. Much elaborate plant has since been erected. Upon the whole the industry is not a good one nowadays, and it is left to a few mines to keep the banner of prosperity waving, and it is an old saying that whatever the price of tin Dolcoath (the premier Cornish tin property) has been able to make a profit.

The Dolcoath mine, after a long and prosperous career during very much of the eighteenth century, was shut up in 1783. After that, however, the steam engines introduced into Cornwall by Boulton and Watt now came to the assistance of those mines which, owing to their increasing depth, were severely handicapped, both as to pumping and winding.

In 1799 Dolcoath once more became a mine in being and has never ceased production either of copper or tin since, although it has had its times of slump. Dolcoath was worked in the eighteenth century to a depth of 160 fathoms and produced copper to the value approximately of \$6,250,000. From 1799 to 1836 dividends were paid out of profits on copper to the amount of \$787,705. After this the returns fell off and the bottom workings, over 200 fathoms below adit, were given up and remained under water until 1846. The position then became so critical that Lady Basset, who had succeeded her father, Lord de Dunstanville, as the owner of the estate, employed Captain Joseph Vivian, then manager of North Roskear Mine, to inspect and advise as to the future working. He recommended draining the deeper levels, and the resumption of development below. This was the most interesting event in its history. Acting on the advice of these experts, the water was drained to bottom, resulting in the discovery that where the copper failed, tin began to be produced, and this ancient copper mine has ever since remained a tin mine.

But a copper mine is not provided with the plant essential to the efficiency of a tin mine. Some six years elapsed before Dolcoath adventurers began to reap the profits of their new outlay on stamps and dressing floors. From 1852 onwards till near the end of the century the mine continued to return enormous quantities of tin and generally to show handsome profits. It was a cost book company and, unfortunately, the system of finance was not judicious. At the same time, for instance, that dividends were being paid the bankers of the company were receiving as much as \$6,000 a year for overdraft and commission. Credit was taken for supplies from merchants and discount for cash was sacrificed. There was no reserve to fall back on in a rainy day. As will happen, the rainy day came. A run of ground occurred by which a number of men lost their lives and it was evident that a spirited outlay was needed if the mine was to be saved. Then those shareholders who had clamboured for big dividends were not prepared to find the money to carry out work which should have been done long before and found, and to do this it became necessary to reconsti-
paid out of previous profits. Fresh capital had to be

tute the company under limited liability. That transformation was accomplished in 1895, and a new financial regime commenced.

From 1799 to 1895 the minerals sold were as follows:

Copper ore	$11,642,285
Tin ore	17,860,895
Arsenic, silver cobalt, etc.	115,795
Total	$29,618,975

The dividends on copper, 1799 to 1836, were	$ 787,705
" " tin, 1853 to 1894, were	3,780,940
Total	$4,568,645

It is believed to be without precedent that a mine of this extent, and one which has weathered such changes of fortune, should have remained for three generations under the control of successive members of the same family, the present able manager, R. Arthur Thomas, being a grandson of the late Captain Charles Thomas, who was appointed manager nearly seventy years ago.

What Dolcoath has achieved since it became a joint stock enterprise in 1895, with a nominal capital of $1,750,000, in $5 shares, is shown by the fact that in the last sixteen years the black tin sold realized a sum of nearly $11,250,000—$11,184,250 to be exact—and the shareholders received a total of $1,477,060. The dividend total has already been raised to well over $1,500,000.

Dolcoath must not be judged solely on its dividend record. Had the policy always been to distribute profits up to the hilt—as it, apparently, was in the old days—the company's record under limited liability would have made a much better showing. Instead of this, a reserve fund was built up, and new works have been carried out, which are of the greatest importance to the stability of the mine. Chief among these new works is the Williams shaft, the largest and deepest shaft in Cornwall, if not in the British Isles. This has been completed only quite recently, and the full benefit of it has yet to be felt. It is a vertical shaft 3,000 feet in depth, and has, with its equipment, cost the company well over $500,000. Electric haulage, electrically worked pumps and tilting bottom cages for automatically unloading are features of this important piece of work. Three cross-cuts connect the old mine workings with the new shaft, but eventually this shaft will be treated as the centre of a new mine, and levels will be started in new ground on the lode at the bottom of the shaft.

In addition to the sinking and equipment of the new shaft the ore treatment plant has been undergoing reorganization. Old stamps have given place to new and electric power has been adopted in this connection also. The Cornish stamps have been dismantled and Holman's pneumatic stamps installed, additional vanners have been procured and sundry other additions to the dressing plant have been made. All these changes and additions have been effected without materially interfering with the regular production of the mine.

PERSONAL AND GENERAL

The resignation of Mr. Waldemar Lindrgen, chief geologist of the United States Geological Survey, is a great loss to that service, but a corresponding gain to the Massachusetts Institute of Technology, to whose geological department he will be now attached.

Mr. H. Westergaard, recently of Johannesburg, has accepted a position with the Canada Sluphur Ore Company, Queensboro, Ont.

Mr. Kirby Thomas, mining engineer, 20 Broad street, New York, spent several days in Toronto last week.

Mr. J. M. Clark, K.C., has gone to England.

Mr. Frank C. Loring, mining engineer, Toronto, is in London, England.

Mr. W. L. Bell is now superintendent of the British Columbia Copper Company's smeltery at Greenwood, Boundary district, B.C., having two or three months ago succeeded Mr. F. J. Longworth in that capacity.

Mr. M. S. Davys, managing director of the Silverton Mines, Ltd., operating the Hewitt-Lorna Doone group, in Silverton camp, Slocan district, has again arrived in British Columbia from England. Before returning to the Old Country he will spend several months investigating development conditions at his company's mine, and will also look into the concentrating-mill requirements, with a view of arranging for the provision of concentrating facilities in place of those heretofore possessed at the leased Wakefield mill, which has been destroyed by fire.

Mr. W. J. Elmendorf is now practising as a consulting engineer, with headquarters in Victoria, B.C.

Mr. E. Hibbert, superintendent of mines for the British Columbia Copper Company, whose method of breaking down very large quantities of ore in that company's Mother Lode Mine, in Boundary district—using as much as 11 tons of explosive at one time—has attracted considerable notice; he has lately been giving attention to the underground exploration of mineral claims in Voigt's camp, where the company holds a large group under option of purchase and on which five diamond drills are being used, as well as ordinary development of the copper-ore occurrences being done.

Mr. Edwin C. Holden, of the University of Wisconsin, Madison, Wisconsin, U.S.A., who is professor in charge of a party of students spending the summer at the Bunker Hill & Sullivan mines, Kellogg, Idaho, early in July paid a visit to Nelson, B. C., to renew old friendships and acquaintances, he having some years ago been on the engineering staff of the Ymir Gold Mines, Ltd., at that time operating a gold mine, 80-stamp mill, and cyanide plant near Ymir, Nelson mining division.

Mr. Frederic Keffer, of Greenwood, B.C., has been appointed acting general manager for the British Columbia Copper Company, Ltd., in place of the late Mr. E. G. Warren. In the summer of 1896, Mr. Keffer went to the Boundary district of British Columbia to prospect several mineral claims, among them the Mother Lode, which was partly developed by the Boundary Mines Syndicate. In May of 1898, the British Columbia Copper Company was organized to acquire the Mother Lode, and Mr. Keffer was its first manager. Six or seven years later, the company, having meanwhile built up an important copper mining and smelting industry, at his own request, Mr. Keffer was re-

lieved of the business management and allotted the duties of geologist nad mining engineer, which have ever since kept him fully occupied. Now the president of the company has directed him to be acting manager. It is not known in the West who will be appointed general manager, but meantime the company is mining and smelting copper ores to the full capacity of its smeltery at Greenwood.

Mr. A. G. Larson, of Vancouver, B.C., in his capacity as consulting engineer, recently examined the Lucky Jim zinc mine, at Bear Lake, Slocan district. Deep-level development work is being done in the Slocan Star mine, near Sandon, as advised by Mr. Larson, who regards the prospects favourable for permanent mining at several properties in Slocan district.

Mr. A. F. McLaine, president of the Traders National Bank, Spokane, Washington, has been re-elected president of the Rambler-Cariboo Mines, Ltd., which company owns one of the most important and productive of the Slocan mines.

Mr. B. L. Sackett, formerly of the Granby M. S. and P. Company's engineering staff at its smeltery at Grand Forks, B.C., and who went thence to the Cerro de Pasco Mining Company's property in Peru, is stated to have been appointed to a position with the Granby Company at its Hidden Creek mines, Alice Arm camp, Observatory Inlet, B.C.

Mr. Alex Smith, who returned to New Denver from Toronto in the spring, and who has been manager of the Surprise mine, near Cody, Slocan, for years, recently completed a long raise from the extension of one of the Last Chance tunnels to the old workings of the Surprise. The bottom of the old workings is about 300 feet from the surface, and the distance driven in making the connection is between 800 and 900 feet. Ventilation having been provided for, stoping, ore will now be practicable.

Mr. Frederic R. Weekes, mining engineer, of New York, has spent the summer at Voigt's camp, near Princeton, Similkameen, B.C., in the interests of clients who are providing money for development of mineral claims there held under option of purchase.

Mr. Roscoe Wheeler, superintendent of the Hedly Gold Mining Company's 40-stamp mill and cyanide plant at Hedley, Similkameen, B.C., has been visiting other stamp mills, investigating their milling practice and gold-saving appliances.

Mr. Thomas Horne has resigned as manager of the McGillivray Creek Coal and Coke Company's coal mine, in Blairmore district, southwest Alberta. He intends visiting Scotland. Mr. George Kellock, who hase been for some time with the International Coal and Coke Company, which operates the adjoining property to that of the McGillivray Creek Company, has been appointed successor to Mr. Horne.

Dr. Henry M. Payne, who last May left New York for Alaska and Yukon, to visit the Klondike and other gold fields in the North, is expected to return south about the end of the summer.

Mr. J. L. Retallack, managing partner in the syndicate owning the Washington mine, Slocan, B.C., is quoted in the "Annual Report of the Minister of Mines," recently issued, as having stated concerning the Washington mine: "The total amount of development carried out in the past two or three years is approximately 3,000 feet. We have developed in this mine about 40,000 tons of concentrating ore, containing, say, 5 to 6 per cent. lead, 20 to 25 per cent. zinc, 2 oz. of silver to the unit of lead, and 0.25 oz. silver to the unit of zinc. We are awaiting the provision of transportation and milling facilities to be able to turn this ore to profitable account."

Mr. Raymond Brutinel, who is associated with a number of important coal and other undertakings in Alberta and Northern British Columbia, has returned to Canada from Paris, where he spent the winter.

Mr. J. M. McSween, formerly interested in the development of the oil shale resources of New Brunswick, is now general manager of the Arminus Chemical Company of Mineral, Va.

The National Steel Car Company, Limited, was organized in July, with a capital of $6,000,000, consisting of $3,000,000 of 7 per cent. cumulative preferred shares and $3,000,000 ordinary shares. The present issue comprises $1,500,000 preferred and $2,000,000 ordinary shares, all of which have been subscribed. The head office of the company will be in Montreal, and works will be established at Hamilton. The company will be under the management of Mr. Basil Magor, formerly president of the Magor Car Company of Passiac, New Jersey.

TECHNICAL LITERATURE

COAL.

Coal Mining in New Zealand.—The Colliery Guardian prints an abstract of the report, just issued, of a Royal Commission appointed last year by the New Zealand Government to enquire into various questions connected with safety and health in mining, with a view to legislation thereon. Respecting the prevention of accidents, the Commission suggest that to meet the requirements of local conditions a committee, consisting of the mine manager, the inspector of mines, and a nominee of the miners should be appointed for each mine, with power to make, alter and from time to time to amend special rules. It is further recommended that Government inspectors of mines be required to pass a special examination, higher than that of mine manager before appointment; that inspectors should have summary power of prosecuting in all cases affecting the safety of workers in mines, and be given power to withdraw men from dangerous places in mines. There are numerous recommendations regarding the employment of deputies and workmen. It is held that a coal miner should have experience in coal-hewing and timbering before he has charge of a place; also that the minimum age at which a miner shall be put in charge of a place be 21 years. High pillar-working has been such a fruitful source of accident, that the Commission recommend that the lifts in pillar work-workings be restricted to 10 feet in height, and that the inspector of mines shall determine the height at which the remaining coal shall be taken out, subject to the right of appeal from his decision. Respecting timbering, it is advised that the maximum width of

boards and cut-throughs, where the board-and-pillar system is followed, should be 12 feet and 9 feet, respectively, for a distance of two yards when opening out or breaking away; thereafter that the maximum widths be 18 feet and 12 feet, respectively. The use of all three-cornered bars or caps in set timbering be prohibited, and no timber should be withdrawn except by lever and chain or by blasting.

In respect of haulage, a number of provisions are made, the chief being the prohibition of chains on all but face jigs, and the substitution of wire ropè therefor. In other directions the Commission, it is evident, have endeavoured to bring the New Zealand enactments in line with the new Coal Mines Act of Great Britain, although some of the requirements would appear to be even more rigorous. Thus, the suggestions of the Commission that the use of electricity should be prohibited in any place in a mine where the proportion of inflammable gas in the air exceeds 0.5 per cent. seems to be excessively severe. The Commission concludes that no new Mines Act is necessary in New Zealand, and that all the recommendations of the Commission can be made operative by means of amendments to the Acts now in force.

Accidents from Explosives.—The annual report of H. M. Inspectors of Explosives (Great Britain) for the year 1911, just issued, states that the number of accidents by fire or explosion during the year was 515, causing, so far as is known, 56 deaths and injuring 548 persons. The total number of accidents shows an increase, namely, 515 against 450, and is above the average (401.1) for the last ten years.

Monel Metal and Corrosion.—Mining Science states that recent experiments made at the laboratory of the Board of Water Supply, New York, indicate that monel metal possesses about the same resistance to corrosive action as the better known bronzes, while it had the additional advantage that it presented the least change in appearance as result of the corrosive action. Specimens of several bronzes, monel metal and steel were weighed and imbedded in rich earth, which was kept wet for six months by periodical additions of very dilute solutions of corrosive salts. At the end of the test period all of the specimens were unearthed, scrubbed, dried and weighed to ascertain the comparative loss from corrosion. The percentages of loss were as follows: Phophur bronze, 0.19; tobin bronze, 0.11; monel metal, 0.12; Parsons manganese bronze, 0.12; Munts metal, 0.33; steel, 1.04.

The Danger of Coaldust in Mines.—On the occasion of the recent annual meeting of the Institution of Mining Engineers, the president, Mr. W. E. Garforth, took as his text for his presidential address the danger of coaldust in mines and the means that might be taken to minimize this danger. It is a subject on which he is eminently qualified to speak; in fact, Mr. Garford is the recognized authority on coaldust problems. Referring to the series of experiments conducted at Altofts, he stated that these demonstrated the efficiency of the stone dust remedy, "stonedust" being "argillaceous shale" dust. The experiment confirmed, moreover, the opinion that an explosion would continue to be propagated wherever there was a full supply of coaldust, and great destruction would result, but that it would rapidly die out on roads where stonedust was present in abundance. The positive action of the stonedust in limiting the extent of the explosion by rendering the coaldust non-explosive, results also in decreasing the amount of deleterious gases formed. Inasmuch as it is estimated that 80 per cent. of the deaths in a colliery explosion are caused by carbon-monoxide poisoning, the importance of preventing the distillation of coaldust and the formation of poisonous gases cannot be overestimated. But the proof of the value of stonedust would be of mere academic interest unless the remedy can be easily and cheaply applied, without interfering with the health of the workmen or inducing any fresh danger. At the Altofts collieries the method has been in use for three and a half years. There stonedust is strewn wherever there is coaldust; that is, on all the mechanical haulage roads, the neighbourhood of junctions where tubs bump against each other, etc. Twelve and a half miles of such roadway have now been treated. The stone is very finely pulverized on the surface, sent down to the workings and distributed by hand by boys with their backs to the ventilating current to prevent unnecessary inhalation of the dust. Near the pit bottom and main junctions the first dressing of stonedust is sufficient to fill up all the ledges and crevices. It is not then so easy for more coaldust to be deposited. Where screens are situated near the downcast pit and coal dust is carried into the mine from the surface extra heavy dressings are applied. Directly the stonedust surface is overlaid with a film of coaldust, a brush or "brush-rake" is passed over the surfaces exposing fresh stonedust, but without fresh dust being used. When this surface has again been overlaid by coaldust, then a fresh dressing of stonedust is applied. Much of the coaldust dislodged by the stonedust falls to the ground and is overlaid by the excess of the stonedust falling from the roof and sides. This system of frequent stone-dusting is carried out wherever the deposit of coaldust is rapid. On the ordinary haulage roads the dressings of stone dust do not need to be so frequent, and the system is modified accordingly. But in all cases as soon as a roadway loses the grey appearance of the stonedust and assumes a darker shade of coaldust, fresh stonedust surfaces are exposed or the stonedusting is renewed. Many ways of applying stonedust have been tried, but none have proved so successful as applications by hand. Experience, moreover, has shown that a small proportion of the stonedust should consist of coarser particles to give it sufficient body to enable it to be thrown with the requisite force against the upper ledges of a roadway, thereby displacing the coaldust. The application of stonedust by compressed air jets leaves something to be desired in that generally the coaldust is not removed by the stonedust, is deposited irregularly.

The frequency of the renewal of stonedust dressings will depend on local conditions, and it is necessary to clean up the excess of mixed dust from time to time. During the first twelve months practical application of stonedust in mines at Altofts the cost was ascertained to amount to only one-eighth of a penny (one-quarter of a cent) per ton of coal raised; and since then this cost has been materially reduced.

Stonedusting will undoubtedly prove of great benefit in those mines where electricity is installed. There is no objection to the use of stonedust where electricity is used, even if falls of roof occur resulting in injury to cables and open sparking; no explosion would result where the stonedust is properly applied, inasmuch as the stonedust would be present with the coaldust and form a non-explosive mixture.

LEAD POISONING.

Mr. James O. Clifford contributes an extremely valuable and illuminating article to the last issue (July 6) of the Mining and Scientific Press on plumbism, its systems, effects and prevention. It is a subject that is worthy of greater study than has been heretofore given to it in this country, and we would commend Mr. Clifford's conclusions to the attention, in particular of lead mine operators and miners in East and West Kootenay, where this industry is an important one, and the disease not uncommon. Of the symptoms of plumbism, one of the first is the peculiar anemic appearance of the patient, accompanied by a disagreeable metallic taste in the mouth, a feeling of sickness, and there is a tendency to vomit, disturbed digestion, poor appetite, obstinate constipation, and a sense of fatigue disproportionate to the energy expended are additional symptoms, while a severe pain develops in the abdomen, accompanied by vomiting, swelling of the arms and severe headaches often accompany these symptoms. The effect of lead poisoning varies with the constitutions of the individuals attacked, but common results are: Lead blindness, temporary loss of hearing, smell and taste; stimulation into activity of neurosal tendency, loss of teeth, accompanied by serious ulceration of the mucous membranes of the mouth; continuous headache, dizziness, sleeplessness, tinkling in the ears, and weakening of will and intellect; chronic constipation, and paralysis of the hands and feet. In consequence of the structural changes of organs for which it is responsible, lead poisoning may be an immediate or contributary cause of death. In the prevention of plumbism cleanliness of the individual and work places is of prime importance. Lavatories with a sufficient supply of hot and cold water should be provided, and daily bathing encouraged. In dusty atmospheres, respirators should invariably be used. Food should not be eaten at any time or at any place until after the face and hands have been washed, and the mouth and throat rinsed thoroughly with an alkaline mouth-wash such for example as 0.2% solution of sulphite of soda. The use of alcoholic liquors and tobacco should be prohibited. Employees should never begin the day's work without first partaking of food. Perfect ventilation should be established in all places where there is danger of dust of fume. Employees should take care to keep the bowels open. Proper foods rich in fats, (and in this milk is included), have an unquestionable preventive value. The most effective protection against the disease are cleanliness and sobriety. Medical examination of employees once or twice monthly should be made compulsory. It is stated that some companies provide tabloids containing 5 grains of hyposulphite of soda to be taken by employees once daily.

Attention is directed to the regulations in force for the protection of employees in the lead industries, notably those of Great Britain, Germany and France. In Great Britain, in particular, the regulations are rigid and include a provision that employers shall provide respirators for men engaged in such work as cleaning flues, while disregard of the rules by employees is punishable by law. This is an important provision for, as is well known, the main difficulty in the endeavour to protect employees from diseases is to ensure their co-operation in the measures provided to that end.

GRANBY COMPANY'S HIDDEN CREEK MINES

(From the "Annual Report of the Minister of Mines," British Columbia, 1911.)

The following report on the Hidden Creek Mines, at Goose Bay, Observatory Inlet, B.C., was made by Mr. Donald G. Forbes, mining engineer, of Victoria, B.C., who, acting under instructions from the Hon. the Minister of Mines for British Columbia, made an examination of the property.

"The Hidden Creek mines, owned and operated by the Granby Consolidated Mining, Smelting and Power Company, are situated in the eastern foothills of the Burniston range of mountains, which rise to an elevation of 5,710 feet, and at this point separate Portland Canal from Observatory Inlet. Goose Bay can be reached from the town of Prince Rupert by steamer in about ten hours. The Dominion Government telegraph line to Stewart passes through the property, and an office has been opened at the landing with a resident operator, appointed by the Dominion Government.

"**Geology.**—The rock formation in which the orebodies occur may be best described as an argillaceous schist; it has been subject to very considerable alteration, and in some places the fissile structure of the argillaceous bands has disappeared and the rock appears to be massive. This rock formation can be traced for several miles along the shore of the inlet to the adjacent islands, and extends nearly to the summit of the mountains to the west of the property, where the Coast granites are found. The ore-bodies are at some points cut by intrusive dykes, but these dykes have no influence on the nature of the ore, nor on its commercial value.

"**Description of Ore.**—The ore consists for the most part of massive iron-pyrites, with some pyrrhotite, chalcopyrite and a little bornite, containing small quantities of gold and silver. In some portions of the ore-bodies both iron and copper pyrites occur in a quartz gangue, while some lime and a little alumina can be found associated with the ore at most points. The gold and silver vary with copper contents of the ore; with a two per cent. copper, together they equal about $1 per ton, and increase in about the same proportion as the copper content advances.

"**General Characteristics of Orebodies.**—Two main orebodies have been proved to exist on the property; both appear to dip to the west, or toward the main range of mountains. Sufficient exploration work has not yet been done to definitely determine the extent or nature of these deposits. At present the eastern orebody, known as No. 1, looks as if it would prove to be a large lens; it has been proved for a length of more than 700 feet in a north and south direction, and its width, with both the northern and southern ends of the workings still in ore, is not less than 180 feet. The No. 2 or western orebody appears to be in the form of a chimney, roughly 500 feet in diameter, but, like No. 1, its limits have not been definitely determined.

"**Development Work.**—A considerable amount of

open-cut work has been done on the surface of both orebodies, at an elevation of from 600 to 900 feet above the sea-level, and several short tunnels have been driven. These workings were all covered with snow and could not be inspected at the time of my visit. This work definitely proved the existence of large bodies of ore, but was of little value for economic mining or in determining the value of the orebodies; it had therefore been decided to drive a working tunnel into the hill at an elevation of 530 feet above sea-level, to cut both deposits.

"**The 530-Foot Level.**—This level has been driven from the southeast side of the hill and has cut the two orebodies, known as No. 1 and No. 2.

"No. 1 orebody was cut at 355 feet from the portal of the tunnel, and the tunnel passed out of ore at 555 feet, and was continued northward through country rock, No. 2 orebody being cut at 805 feet.

"Development has been vigorously pushed forward on No. 1 orebody; the best ore has been located by surface work to the south of the main tunnel, and it has been proved in that direction, at this level, for 600 feet, the faces of the drifts being still in ore. Diamond drills have been extensively used in prospecting work, and, where the drill-holes have afterwards been drifted out, the assay value of one from the drifts has corresponded as nearly as could be expected with the assay results obtained from the drill cores.

"Considerable diamond-drill work has been done below this level, and tends to show that the orebody exists and maintains its value to the next level (elevation 385 feet), while one hole, No. 12, has been carried down at an angle of 45 degrees, to sea-level and left off in 11 per cent. copper ore.

"In No. 2 orebody drifts Nos. 4 and 5 have been driven north and west from the main tunnel; the face of No. 4 is still in ore, while No. 5 broke through to the surface, all in ore. Drill-hole No. 16 is also in ore, thus proving an ore chimney of considerable size, the actual limits of which have not yet been determined. Development work is still being pushed forward, and is at present being confined principally to No. 1 orebody, 60 men being employed underground.

"**The 385-Foot Level.**—This level is being driven with a view to cutting both orebodies, and will be used as the chief working tunnel, the ore from the upper workings passing through it to the crushers and bins, which will discharge at 100 feet above sea-level to the conveyors of the smelting plant, which it is proposed to erect near the beach at Goose Bay.

"**Ore Reserves.**—At the present early stage of development it is not possible to give complete and exact estimates to the 'ore in sight' in the mine and its value, but it may be safely stated that there is available for extraction above the 530-foot level not less than 4,500,000 tons of ore, containing 1.8 per cent. copper and a combined value of $1 in gold and silver. The management also states that it has sufficient 4 to 5 per cent. ore 'in sight' that could be sent to a custom smelter, to more than repay the expenditure on the property, in the event of a smelter not being erected. Up to date no ore has been shipped by the present company. Ten cubic feet of ore in place are reckoned to the ton.

"**Mining.**—The cost of extracting ore from these mines should be very moderate; the ore is massive in character and the country rock very solid, so it will be practicable to remove nearly all the payore between the levels, only sufficient being left in place to keep them open. Very little timber will be required, except for chutes. The ore varies much in toughness, in some places drilling and breaking well with machine drills, while in other parts progress is slow.

"**Machinery.**—The present machinery equipment of the mine consists of a 14 x 22-in Rand duplex air-compressor, driven by a Pelton wheel, and a small electric generator driven by a turbine, used for lighting purposes, both of which are located at sea-level. At the mine, a small hoist, used on surface tramway to bring supplies from the 385 to the 530-foot level, a drill sharpening machine and one diamond-drill, and as many rock-drills as the capacity of the compressor will allow, are in use. A small sampling-mill is being erected. Plans for the erecetion of a smeltery and converter plant, having a capacity of 2,000 tons of ore a day, are being considered, but it is probable that the whole plant will not be erected at once.

"Sufficient water power for all purposes is available for the greater part of the year, but an auxiliary steam plant will be required during the winter months, for the creeks, being glacial, run low for several months in winter.

"Sufficient timber for mining purposes can be obtained in the neighbourhood, but being all spruce and hemlock it makes poor fuel, and coal will be probably used for the steam plant.

"The property being situated close to salt water, the working conditions are as favourable as can be obtained in this province, and I consider the property a mine of great promise; in fact, the best that I have seen in British Columbia for many years.

"My thanks are due to the management, who placed their plans and the data they had collected at my disposal for the purposes of this report.

"The following results were obtained from samples handed to the Provincial Government assayer. The samples were taken with a view to showing the class of ore in No. 1 and No. 2 orebodies, and were not intended to represent the average value of ore in the mine:—

SAMPLE OF ORE	[illegible]	[illegible]	[illegible]
No. 2 orebody, No. 4 drift...	trace	0.40	1.87
No. 1 orebody, No. 10 drift..	"	0.44	1.76
No. 2 orebody, No. 6 drift...	"	5.56	8.62
No. 1 orebody, No. 2 drift...	"	1.50	7.50

(Note.—It should be remembered that the foregoing report deals with conditions as Mr. Forbes found them when he visited the property last winter. Since then six or seven months' development work has been done. While the management is confident there is more than 5,000,000 tons of ore already "in sight" in the mines, and a fair proportion of this containing more than two per cent. copper, it has not been found as a general result that the ore contains more than $1 in gold and silver to the ton of ore, not even where the copper content is comparatively high. While there has been authorized by the directors of the company an expenditure of $300,000 on surface works, including construction of docks and tramway, and a dam and other work in connection with a hydro-electric power generating system, it is not intended to this year proceed with the erection and equipment of a smeltery. Much underground development is being done in the mines, though, and this expenditure is in addition to that above-mentioned in connection with surface work.)

OTHER LODE GOLD MINE, SHEEP CREEK, NELSON MINING DIVISION.

The Mining Journal of London, England, publishes its issue of May 25th the following contribution from correspondent, Mr. Alexander Gray, of Montreal, ue., who, being on friendly terms with the principal ners of shares in the Mother Lode Sheep Creek Ming Company, is in a position to obtain information ncerning its affairs:

"The mill of the Mother Lode mine started crushing May 6, and in view of the interest attaching to the heep Creek field, a few particulars may be welcome. he mine, which is controlled by the Hollinger group, in charge of Mr. William Watson, who states that e developments show a gross value of more than ,000,000. The mill is of Merrill design, and is a odel in point of compactness and substantial conruction, the flow-sheet being calculated to obtain a gh extraction. The automatic tram delivers the ore a 20 x 10 Blake crusher, thence to a 350-ton bin. rom there the ten 1,250-lb. stamps take it, the crushed oduct passing to the first classifying cone, where they t two products, the underflow going to the tubeill. The overflow is by-passed and rejoins the reound product from the tube-mill. Then there are ates, a Frenier pump, a second classifying cone from hich the underflow is returned to the tube-mill, and ter that a Dorr thickener. The underflow from the ickener is taken by two Aldrich slime pumps, and the verflow goes to the collecting tank. Merrill metalirgical practice is pursued through Pachuca tanks in ries. More Dorrs, mechanical agitation and Merrill ime presses, Merrill classifying presses, Merrill prepitating presses, thence to the refinery, where the ad method is employed. The details of Merrill pracce need not be reiterated. The mill, in its way, is a odel of neatness and efficiency, in which Mr. Frank . Languth, of the Merrill staff, takes justifiable pride. he 10-stamp mill is rated at a daily capacity of 70 ons, and assuming a recovery of $14 a ton and aver ging 26 working days, a net profit of $25,000 per onth is expected. Power is obtained from the comany's hydro-electric plant, and low working costs are nticipated."

It should be added that if Mr. Gray is correct in the tatement that a recovery of $14 a ton is expected, he ppears to have omitted working costs when calcuating expected net profits. E. J.

CANADIAN MINING INSTITUTE, WESTERN BRANCH.

The thirteenth general meeting of the Western Branch of the Canadian Mining Institute was held at Greenwood, Boundary district, B.C., on Thursday, June 27. In the unavoidable absence of the chairman, Mr. R. R. Hedley, the chair was taken by Mr. Frederic Keffer, of Greenwood, an ex-President of the Institute.

Ballotting for the election of chairman and other members of the branch council for the ensuing year resulted in the unanimous election of Mr. M. E. Purcell, of Rossland, superintendent of the Consolidated Mining and Smelting Company's Centre Star group of mines. Others elected members of the branch council, and the ex-officia members, are as follows:—W. H. Armstrong, S. S. Fowler, Chas. Graham, Thos. Graham, J. Cleveland Haas, Robert R. Hedley, John Hopp, Frederic Keffer, Thos. Kiddie, A. G. Larson, F. Chas. Merry W. F. Robertson, R. H. Stewart, O. E. S. Whiteside, W. R. Wilson and W. E. Zwicky.

The chief subject before the meeting was "The Copper Mining Industry of British Columbia," in connection with which there was read one paper giving historical, statistical and general information concerning the industry—mining and smelting—as a whole. The historical notes gave the sinking of the Old Shaft, down the coast from Skidegate, Queen Charlotte Islands, as the first officially recorded attempt at copper mining in the province; then, copper ore was discovered at Sooke, Vancouver Island, in 1864, and near Howe Sound, on the mainland, in 1865. An excerpt from the "Report of the Minister of Mines, 1874," gave information relative to copper ore on a branch of Jarvis Inlet, and one from the Report for 1877 of the "Howe Sound Copper and Silver Mine." Discoveries in Nelson district, at Stump Lake, between Kamloops and Nicola, in Boundary district, in Rossland camp, and at Mount Sicker, on Vancouver Island, respectively, were all mentioned. The first production of copper on record was in 1894, probably from the Silver King mine, near Nelson; in 1895 Rossland commenced to produce copper; in 1898 the Coast district, and in 1900 the Boundary were added to the producing districts. Production of other parts of the province has been comparatively small thus far. Total production of copper to date is 452,281,365 lb., of which 63,000,000 lb. was produced in eight years to end of 1901, 180,000,000 lb. in five years 1902-6, and 209,000,000 in five years 1907-11. By districts, the production has been:

Boundary, 301,574,000 lb.; Trail Creek (Rossland), 84,201,000 lb.; Coast, 49,821,000 lb.; Nelson, 13,363, lb.; other districts, 3,322,000 lb. Smelting of copper ores was commenced at both Nelson and Trail in 1896, at Van Anda (Texada Island) in 1899, at Grand Forks in 1900, at Greenwood in 1901, at Boundary Falls in 1902, and at Crofton and Ladysmith, both on Vancouver Island, in 1902.

Other papers read were as follows: "Notes on Copper Mining in the Coast District," by Mr. W. M. Brewer; "Notes on Method of Handling Ore on the Surface at the Centre Star Mines, Rossland," by Mr. M. E. Purcell; "Consolidated Mining and Smelting Company's Copper Smelting Department, Trail," by Mr. Jas. Buchanan, and "Notes on Copper Mountain Camp, Near Princeton, Similkameen," by Mr. Frederic Keffer. The secretary read a report on the Granby Company's Hidden Creek mine, on Alice Arm, Observatory Inlet, made for the Provincial Department of Mines by Mr. Donald G. Forbes.

ASBESTOS.

The U. S. Geological Survey has published a bulletin on asbestos, containing the following hints on prospecting for this mineral: Asbestos occurs only in ancient crystaline rocks of Paleozoic or earlier age, and the rocks in which it is found are almost invariably of igneous origin, peridotite altered to serpentine being by far the most important. The conditions to be chiefly observed are the purity of the serpentine, its flexures and the presence of granite. The purer the serpentine the more likely it is to form asbestos, while the more abundant the fractures, especially if the serpentine be intruded by granite, the more likely it is that the circulating magmatic waters will have formed asbestos.

SOME NOTES ON MODERN GOLD MILLING

No subject in relation to ore-dressing or milling practice is at present more prominent than that having to do with the possible supercession of stamps, and even of amalgamation in favour of step reduction, fine grinding and direct cyanidation. There can be no doubt that for certain classes of ores in which the values recoverable by amalgamation fall below a given percentage, preliminary amalgamation is not economical. But it is quite impossible to establish an arbitary standard or rule: the question is essentially empirical, and each case must be determined on its individual merit, having regard to the economic conditions obtaining and the physical characteristics of the ore. In Ontario, for example, no one would soberly advocate the abandonment of amalgamation as a process for the treatment of the Porcupine gold ores. These are essentially free-milling, and, therefore, ideally amenable to amalgamation treatment. It is a question, however, whether step reduction, employing tube-mills, will not here give a better return than stamps, while, of course, the initial cost of equipment and installation is greatly in favour of the former.

The gold ores at Long Lake, near Sudbury, afford an example of the other extreme. Here the attempt to amalgamate proved inefficient, the percentage of gold recovered being practically negligible, and the process was abandoned absolutely in favour of direct cyanidation by which means an economic and adequate extraction averaging 90 per cent. of assay value, has been obtained. But between these two extremes, in the case of either of which the problem is relatively simple, there is a wide range; and it is in relation to the treatment of ores of a semi-refactory, or worse, nature that the real interest centres.

In an article on gold mining in the Transvaal, which we have reviewed elsewhere, Dr. F. H. Hatch makes the statement that some metallurgists advocate the total abolition of the amalgamation process in connection with the treatment of the gold ores of the Rand. But that there is a great divergence of opinion on this and other points respecting present-day practice in South Africa is evidenced by the recently published views of Mr. H. Stadler, engineer of Research Work to the Mines Trial Committee, of Johannesburg, who manifestly not only disagrees with this standpoint, but shows that in a large degree the innovations of late years, especially as regards fine grinding, have been based on "utterly wrong principles," and have actually resulted in an increase in reduction costs. As his conclusions have a general application, they will bear summarizing:

(1) The higher extraction claimed for finer grinding has, in consequence of mistaken deductions, been grossly exaggerated. (2) Any classifier with its overflow velocity well adjusted, acts as an efficient concentrator in which the specifically heavier pyritic particles are preferably retained in the underflow. The abandonment of the old proved Spitzkasten in series, in favour of cones in sets, is, therefore, deprecated. (3) The profit resulting from higher extraction by finer grinding is practically nullified by forfeiting the good effect which a high percentage of extraction by amalgamation has on the total extraction. Besides the advantage of quick realization of profits, a high extraction by amalgamation has far-reaching effect on total extraction, consequent on the lowering of gold contents left in the final pulp for cyanide treatment. Thus assuming it were possible to obtain an amalgam extraction of 90 per cent. from a low grade ore, say 5 pennyweights, the low residue value (.5 pennyweight) would make the cyanide treatment altogether unnecessary. (4) Grinding finer than the plus 200 mesh, he considers mere waste of energy and money. Mr. Stadler's main point is that the employment of tube mills for grinding considerations, in other words, that they should not be required to undertake that part of the crushing duty which may be more efficiently performed by stamps. It has been proved experimentally that the mechanical crushing efficiency increases with the coarseness of the screen mesh. The advantage, however, of a high amalgam extraction, obtained by double amalgamation before and after tube milling, is so marked that to forfeit this advantage by crushing so coarsely that no amalgamation before tube milling is possible is not advisable. The use of fine battery meshes will, therefore, be advantageous, even at a cost of a probable loss in daily tonnage treated.

There can be no doubt that these conclusions are sound in the main, though exception may be taken to the infallibility of certain of the statements advanced.

THE MINING AVERAGE.

Apropos of the recent organization of the Canadian Mining & Exploration Company, to which we recently made editorial reference, the report of the mining and investment department of the U. S. Smelting, Refining & Mining Company, is interesting as indicating the investigation that must necessarily be undertaken, the energy and work required in sifting the chaff from the grain, before such effort can expect to be rewarded. Thus, exclusive of proposals rejected offhand, the company in question had under consideration 921 properties. Of these, so states the report, "an examination by the office nearest the property concerned, coupled with the knowledge of the geology and working costs of the respective districts, was sufficient to warrant the rejection of 749." Field examinations were made in respect of the remaining 144 properties, 28 of which proved worthy of more careful investigation. Only one of this number was acquired. Nevertheless the acquisition of one meritorious property might readily represent an excellent year's work. And, after all, the proportion of 1 to 921 is nothing out of the ordinary, when one considers the usual ratio of good to worthless mines in nearly any established camp.

According to a bulletin recently issued by the United States Geological Survey, the graphite mining industry in that country has experienced nearly, if not quite as many, vicissitudes as that of our own. Thus it is stated that there are to-day in the United States more abandoned graphite mines and mills than there are in operation, and, again, "the number of times that some of these properties have changed hands in the course of a few years evinces a record of misrepresentation and disappointment that can hardly be equalled in any other branch of mining." In the United States, as in Canada, the rock on which the industry has split is the process of concentration, the technology of which with respect to the treatment of flake-graphite is still to be perfected. There have been notable advances of late

›wever, and one or two of the new mills in the Buckgham district, in particular, have made very creditıle records.

The Mining and Engineering World (Chicago) draws ;tention to the fact that one hundred and eleven merican mining companies have to date paid diviends aggregating the prodigious sum of $730,592,965, ıd representing $61,695,539 over and above the ·iginal combined capitalization of the undertakings. f these companies, fifty-two belong to the United

It is announced that gold to the value of about eight ıillion dollars will be coined in pieces of five and ten ollars, at the Royal Mine at Ottawa during the present ear. Canadian gold coins have been in circulation for ɔme little time past, but are not likely to replace paper urrency in popular favour. The project of coining ilver dollars has been wisely abandoned. In this hot ›eather it would have been a heavy affliction, and, at ll times, a burden to the rich.

The Secretary of the Interior of the United States is ccused of being "vague and indefinite" in expressing n opinion on whether or not the Bureau of Mines hould tackle metallurgical problems of a "local and ›rivate" nature. But what are "local and private" ›roblems? The solution of any problem that will aid ın individual enterprise will benefit the mineral indusry as a whole. This surely is axiomatic. There is, ıowever, a happy medium between work that may be egitimately undertaken by Government in the general nterest, and that infringing unduly as the purlieu of ›rivate enterprise. Such competition is unfair; and he Government official honestly keen to render his serrice efficient does not always know when or where to lraw the line. Nevertheless, broadly speaking, officiallom is right in acting on the old, well-worn adage of the "greatest good to the greatest number."

Some experiments have been conducted recently in Scotland to ascertain the oxygen consuming power of a naked flame. These tests showed that a lamp burning oil consumed 1.13 cubic feet of oxygen and produced 0.78 cubic feet of carbonic acid per hour. The same lamp when burning tallow consumed 2.49 cubic feet of oxygen and gave off 1.74 cubic feet of carbonic acid in an hour. A miner's tallow lamp, consuming 17.4 gms. of tallow per hour, averaged, with uniform flame for 15 minutes, 2.3 candle power, while a lamp consuming 13 gms. paraffin wax per hour gave 1.6 candle power.

The deepest gold mine in the world until lately was that of the New Chum Railway Company at Bendigo the shaft at which is sunk to a depth of 4,120 feet. This record has since been surpassed by another gold mine, the Victoria, in the same district, whose workings are down 4,600 feet. Again in Brazil, at the Morro Velho mines, a vertical depth of 4,926 feet has been attained. In the United States, the deepest gold mine is the Kennedy shaft, 3,500 feet, in California. The world's deepest mine, however, is No. 3 shaft of the Tamarack Copper mine, which is down 5,222 feet or only just short of a mile. In Canada, the deepest workings are probably those at the Eustis mine, in the Eastern Townships.

The New British Mines Coal Act.—The Colliery Guardian notes that in addition to the various changes brought about by the new Coal Mines Act in Great Britain, the new regulations regarding the use and storage of explosives in coal mines, came into force on July 1st. The main features of the new order are the more detailed restrictions respecting the use of explosives in mines, the standardization of cartridges, the regulation of the size of rock-drill bits, precautions to be taken in the case of miss-fires, especial provisions for firing mines and regulations in the case of sinking operations. In firing mines, for example, it is required that only an efficient magneto-electrical apparatus shall be used for shot-firing or in sinking pits, not even a primary battery being permissible. The other regulations are equally stringent. Thus, each large mine must receive the daily supervision of a separate duly-qualified manager, who must enter records on a perplexing variety of forms, while there are also provisions as to countersigning and posting of reports. There are also new provisions as to plans. The new ventilation standards make a heavy call upon the judgment of the manager, both as regards the organization of his staff and the specific compliance with the Act in respect of measurements. Under the head of Shafts, provision is required for increased dimensions, of two means of egress, the fencing of shaft bottoms, etc. Under the egresshead of Haulage, very exacting requirements are specified, while for timbering, underground telephone communication, the use of electricity, the removal of coal-dust and other details, new regulations have been made. Finally, more rigid inspection is demanded. Two inspections must now be made during each shift, and no place must remain uninspected for more than five hours at a stretch. In short, the lot of a colliery manager in Great Britain would not appear to be a particularly enviable one.

Microscopical Investigation of Coal-dust.—At a recent meeting of the Manchester Geological and Mining Society, a paper was read by Mr. James Lomax, a recognized authority on this subject, of which the following is a summary:—

"It is now generally acknowledged that coal is the product of terrestrial vegetation of long ages ago, and through being able to get material which contains plant remains in a petrified condition, we can almost with certainty demonstrate to what type, or classes of plants we owe our coal-seams. This is certain in the dominant types. This being so, we are enabled, in combination with impressions of fossil plants, to account for the material we should expect to find composing a coal-seam. It is also acknowledged that many coal-seams give off a large amount of inflammable dust according to the stratificial conditions, such as depth from the surface, moisture, etc., and also the method of working. This holds good to the majority of so-called bituminous coals, but not so with the anthracites. Therefore, there is some reason or cause that some seams give off more inflammable dust than others. This is mainly through the conditions under which the vegetable debris was laid down and the class or types of plants from which it was derived. If we look around us and pick up a few fossil plant impressions, or, better still, visit some museum well stocked with coal measure fossil plants, what do we find That at least one-half of these belong to the lycopodaceous family, whilst the remainder consist of at least five different kinds—Equisetinae (Calamites, etc.), Pteridosperms (Lyginodendron, etc.), Gymnosperms (Cordaites, etc), and Filicinae (the true ferns), the last being both small in size and quantity. That being the case, we should expect a seam of coal to be composed of the remains of the dominant types of the time

SPECIAL CORRESPONDENCE

ONTARIO

Cobalt, Gowganda and South Lorrain.

ORE SHIPMENTS FOR JUNE.—The shipments of silver ore from the Cobalt district came from three sources Cobalt, Gowganda and New Liskeard in the month of June. According to the official list as compiled by Mr. A. A. Cole, the shipments totalled:

Cobalt Proper—	
Buffalo	123.48
Cobalt Townsite	199.20
Chambers Ferland	32.00
Cobalt Lake	134.85
Coniagas	117.54
Crown Reserve	49.03
Drummond	20.74
Hudson Bay	31.60
Kerr Lake	30.37
La Rose	274.96
Lost and Found	15.00
McKinley-Darragh	202.81
Nipissing	227.91
O'Brien	31.25
Temiskaming	95.52
Trethewey	77.26
	1.663.52
Gowganda—	
Millerett	20.00
New Liskeard—	
Casey Cobalt	43.85

This was shipped as follows: 33.07 per cent. to Canada, 65.59 per cent. to the United States, and 1.34 per cent. to Germany.

The Lumsden.—It has been made public recently that high grade ore is being mined on the Lumsden property in south-east Coleman. The management has long known of the existence of this high grade, but the shoots have been short and it had been determined to keep the matter secret until some degree of permanence was assured. The discovery was first made on the 300-foot level, but the same ore shoot has now been located on the 250-foot also. The ore is very high grade. The main shaft is down to the 400-foot level in the diabase, and here so far nothing has been located. The property is owned by Mr. John Lumsden, of Ottawa, who is to date considerably out of pocket by his Cobalt venture.

The Majestic.—The Cobalt Majestic, one of the wildest flotations of the early days of the camp, has paid its creditors a hundred cents on the dollar. The property was long in the liquidator's hands, and he has recently sold some properties which enabled the company to pay off all debts. If any more claims are sold the stockholders of the company might even benefit though that possibility is remote.

The Nipissing's Progress.—The production of the Nipissing for the month of June was $225,162 net, while the shipments of ore and bullion amounted to $220,048.

Vein 73 still continues the biggest producer. Work is confined to the second and third levels. To the east of the shaft a drift has been started on a small seam running at right angles to the main vein. This drift at the beginning of the month was in twelve feet, and the vein assays 1.500 ounces with a width of one inch. It is possible that this branch may prove to be vein 74. On the surface this vein is small, but has considerable length. It was open-cut in 1906, but the ore was low grade at the surface. Two stopes are ready to produce at the third level. The vein in both averages three inches in width and assays 2.500 ounces. There is much silver in the wall rock, and it is likely that both stopes will have a width of at least ten feet. A drift has been started on a branch of the main vein at the third level, and is now in 18 feet. The ore assays 1,200 ounces over a width of one inch. A cross cut has located the main vein east of the fault, showing a throw of 58 feet. The ore assays 1,200 ounces, but the vein is small. The vein will probably widen out as it is drifted on away from the fault. An incline following the ore between the second and third levels shows 67 feet of ore assaying 2.000 ounces over a width of six inches. The ore is still in the face.

In exploration work at shaft 64 the shaft is down to the 400-foot level and the fourth level will be put in at 440 feet. Raising from the third level several hundred feet east of the shaft ore was encountered from two to twelve inches wide of 1.800 ounce value.

No. 100 vein is developing longer shoots than was anticipated when the work was commenced. Between the Meyer vein and No. 100 several small veins are being developed. One of the raises shows 75 feet of ore assaying 2.000 ounces over a width of an inch and a half.

The high grade mill treated 181 tons of ore during the month, the bullion shipments from the mill amounting to 326.278 ounces valued at $198.824.

The hydraulicking operations on Nipissing Hill have discovered the extension to vein 92. It carries between one and two inches of high grade ore. Two other veins have been discovered one two inches wide of 1.063 ounces, and the other one inch wide of 1.744 ounces.

The larger vein has been exposed for a length of forty feet.

PORCUPINE AND SWASTIKA

THE DOME IN OPERATION.—The Dome mill is the only plant operating in the camp that could furnish figures that would establish the camp on a thorough sound basis, but the management has not as yet seen fit to do so, the other mills, with the exception of the McIntyre, which is, of course, only of ten stamps, have not been running long enough yet. It is an incontrovertible fact, however, that actual practice at all the four mills has more than proven all the contentions that were made for them. During the month of July the Dome will treat 325 tons of ore per day with the prospect in the near future of raising it to 400 tons. It is making an extraction of 96 per cent. altogether. An average grade of ore reports vary all the way from $8 to $20 per ton. For several days in succession the clean-up ran $6.000, but it is generally conceded that this is above the average.

THE VIPOND.—The Vipond plant has so far proven entirely satisfactory. With the rolls crushing to one inch only, between 75 to 80 tons per day were milled, so that it will be possible easily to make a daily aver-

...e of one hundred tons and better. During the month of July it will probably average about 75 tons. The daily saving will be on the tables, the tailings running into a swamp where they will be dammed up until they can be retreated. An extraction of 85 per cent. can easily be obtained.

ALSO THE HOLLINGER.—Mr. P. A. Robbins is pleased with the practice at the Hollinger. All thirty stamps are now dropping and a duty of nine tons per stamp can easily be maintained. Ore for the mill is being obtained from the dump and the first level. One day this month the mill was running on $17 ore and there will be no difficulty in obtaining an average of between $25 and $30. The pan amalgamators will not be used, save when some very high grade ore is being run through the mill.

AND THE McINTYRE.—At the McIntyre a six days' run produced a brick worth $5,400. The mill is being run at full capacity. With these four mills running the camp should earn enough before the end of the year to, in some measure, retrieve its position in the public eye, forfeited by its long period of sterility.

OTHER MINES.—Mr. F. W. Summerhayes, who has succeeded Mr. John Macdonald as manager of the McEaneny mine, has at once commenced to excavate for the foundations of the five-stamp mill to be installed. The work will be pushed forward with all expedition.

Within the past six weeks development has commenced on two properties which heretofore have received little or no attention. The South Dome claims are being prospected by the Montreal syndicate, already operating the Dome Lake. Work so far has been confined to the surface. In the Pearl Lake section a shaft is being sunk on the Christ claim adjoining the McEaneny.

It has at last been decided to suspend work on the East Dome claims, the only properties remaining to the Preston East Dome Company when they refused to make any further payments on the Preston claims. That the struggle to find pay ore would be unsuccessful has been more or less of an open secret for some time and the decision to close down causes no surprise.

While the Crown Chartered, on the Davidson, has not yet run into the ore shoot at the 200-foot level, the vein has been picked up and looks very encouraging. It is at least fifteen feet wide and only one wall has been discovered as yet in the raise.

Thirty to forty miles south of the Transcontinental Railway, at the Harricanaw River Crossing, a considerable amount of development is in progress. Gold discoveries on the banks of the Harricanaw River caused a small stampede of prospectors last winter, with the results that several hundred claims were staked. Coarse gold can be seen in narrow quartz veins. On the Sullivan properties a gang of men is at work and the success or non-success of it will probably decide the fate of the camp as a gold mining field. On Keewagama Lake and River Mr. M. J. O'Brien is developing the Independence mine, where there is reported to be silver and zinc, and at the Peninsular mine a level is being run at fifty feet to open up a deposit of molybdenite and bismuth.

PROSPECTING.—Most of the mining syndicates on the "qui vive" for good prospects in the North Country, have sent their scouts in to the Tough claims, some six miles north of Swastika. The vicinity of Kirkland Lake was the scene of a little excitement last winter and the Tough claims are about a mile distant. One vein has been stripped for 250 feet. It is on the surface as well defined and regular as a Cobalt silver vein and is not more than four inches wide. It is very rich in many places. The porphyry is heavy with sulphides and an official report states that it carries some values. In a dyke of porphyry, the walls of which have not been defined, occur veinlets of quartz and a considerable amount of coarse gold is to be discovered in these.

BRITISH COLUMBIA

The first half of the year has closed with mining operations generally being carried on vigorously in the more important mining districts of the province, so that thus far the favourable forecast made in May and published in "The Canadian Mining Journal" of June 15 seems to have been warranted, at any year is concerned. With the average New York rate so far as the expired portion of the cents an ounce higher than that for the year 1911, and for electrolytic copper nearly three cents a pound higher, the total value of production for the half year has been increased correspondingly. Whether prices will be maintained throughout the remainder of the year, it is, of course, not possible to positively conclude, though the probability is they will be. However, there is much satisfaction in contemplating the results of the half year's operations, which are known to have been generally favourable. The good effect of the improved conditions is indicated in the survey of the position to follow presently. Meanwhile a few other mining notes may be of interest to readers of the "Journal."

French's Process for Separation of Zinc and Lead.

Mr. Wm. Fleet Robertson, Provincial Mineralogist for British Columbia, in the "Annual Report of the Minister of Mines, 1911," recently issued, says:

"For the past year or so, A. Gordon French has been conducting a series of experiments in Nelson, B.C., with the object of separating and saving the zinc occurring in the Slocan ores in conjunction with silver-lead and iron. He has equipped the old city electric light station on Cottonwood Creek as an experimental plant, where a series of experiments have been carried on which culminated in the development of a process which, Mr. French claims, has solved the problem commercially and produced an electrolytic zinc product of great purity.

"Much publicity has been given to this process and to the claims of its success, and, since a commercially feasible process would be of great importance to the district, the matter was investigated by the writer, who, in September, 1911, visited Nelson, when he was shown over the plant by Mr. French and the process explained."

Note.—The description of the process was printed in "The Canadian Mining Journal" of January 1, 1912, page 6. The following are additional notes, also prepared by Mr. Robertson:—

French's Zinc Process.

"Mr. French has patented at least a portion of the process, his Canadian patent, No. 136,341, covering the process down to the getting of the zinc into solution in water slightly acidulated with sulphuric acid, and Mr. French stated to the writer that he has applied for another patent covering the fractional electrolytic deposition of the zinc, but whether this has been issued is not known.

"This Bureau has made no attempt to test the commercial value of the process, but has made some investigation as to the principles involved.

"The electrolytic zinc produced in the experimental plant was assayed, and found to contain 99.5 per cent. zinc, 0.5 per cent. copper, with 0.2 oz. silver to the ton, a highly satisfactory product.

"In an investigation as to the effect of sulphuric acid on the oxides of lead and zinc present in the roasted ore, it was found that the acid had a selective action, and first converted the lead-oxide into lead-sulphate before reacting on the zinc-oxide to any extent. This selective action was noted both in the roasted ore and also with definite quantities of the pure oxides, as will be seen from the following experiments.

"An experiment was made to further demonstrate this point as follows: Pure oxide of lead (litharge) and oxide of zinc were mixed; to this was added dilute sulphuric acid, but not in sufficient quantity to sulphate all the lead-oxide present. With repeated stirrings, this was allowed to stand for 24 hours at a temperature of 40 degrees C., when it was found—first, that there was no free acid remaining and, second, that lead-sulphate had been formed, but practically no zinc-sulphate, the zinc remaining as an oxide.

"A further experiment was made as follows: Commercial zinc-sulphate was dissolved in water; to this solution lead-oxide (litharge) in excess of the acid was added and allowed to remain for 24 hours under similar conditions, when it was found that the zinc-sulphate had been converted into zinc-oxide and some of the lead-oxide into lead-sulphate.

"It would seem from this that the amount of 'nitro-cake' necessary to add must be sufficient to contain enough sulphuric acid—first, to sulphate all the oxide of lead present in the roasted ore, and, in addition to this, sufficient to afterward sulphate the zinc-oxides present. Consequently, if a large percentage of lead were present in the ore, perhaps a prohibitively large amount of 'nitro-cake' would be required."

ATLIN AND CARIBOO.—As it is not until after the close of the season that dependable news of placer-gold mining is obtainable, little more can be written now than to state that the larger hydraulic mines in Atlin camp, and in both Cariboo and Quesnel mining divisions of Cariboo district, are nearly all being worked to the full capacity that available water will allow. In some other parts of the province summer rains have fallen, and there has been fewer hot days than in ordinary seasons. If similar weather conditions have been experienced in the above-mentioned placer-mining districts, then the operating season may be expected to be proportionately longer.

EAST KOOTENAY.—The only metalliferous mine in this district producing much ore this year is the Sullivan, which, during six months to July 1, shipped about 16,000 tons of lead-silver ore to the smeltery at Trail. Newspaper reports published lately have been to the effect that some work is being done in the old St. Eugenie mine, Moyie Lake, and that the Aurora, situated across the lake from the St. Eugene, is also being worked. Several other lode properties have men doing development work on them, while placer mining is being carried on in various parts of the district, but not on a large scale. Coal mining in the Crow's Nest district is without unusual features just now.

WEST KOOTENAY.—In this extensive district, there is much mining activity, and it is gratifying to note that this comment applies to nearly all the mining divisions in which productive mining is usually carried on.

In Ainsworth division, at the Blue Bell mine on the east side of Kootenay Lake, in Ainsworth camp on the west side, at the Utica and Whitewater group mines up from Kaslo toward the divide between this division and Slocan, and in smaller degree at other places, is work in progress. As these parts will probably shortly be visited by the writer of these notes, mention of individual properties will be deferred.

Across the divide, in Slocan division, the position is decidedly promising. The construction of the branch railway line from Three Forks to Bear Lake is being rapidly advanced towards completion, so that it is expected shipment over it of ore from the Lucky Jim zinc mine and the Rambler-Cariboo silver-lead mine will be commenced in the early autumn, both mines having much ore available for shipment. In the vicinity of Sandon, development work at the Slocan Star and Payne mines is being pushed forward, the work of driving the long cross-cut tunnels on these properties, respectively, being continued uninterruptedly. That on the Slocan Star may be expected to reach the ore zone in September, while at the Payne a longer period will probably elapse before a similar result will be achieved. The Richmond-Eureka continues to make occasional shipments of ore to Trail, but in much smaller quantity than last year. The Ruth-Hope group is another of the producing mines in the same locality. In the vicinity of Cody the Noble Five and Reco are making preparations for production, but neither has sent out much ore as yet this year. At the Surprise the long raise has at last been put through to the old workings, so development of this mine will hereafter be practicable with better prospects of production than during the long period during which attention had to be concentrated upon the work of making connection between the low-level adit and the 300-ft. level above. Several other properties in the vicinity of Cody are being worked, and this part of the Slocan district appears to give much promise of soon becoming important as regards production of ore. There are several mines in various directions from Three Forks upon which work is being done, and these will add to the output of ore from this division. In Silverton camp, near Slocan Lake, the Standard, Van-Roi and Silverton Mines companies, respectively, are employing many men. The good results being obtained from operations at the Standard especially are attracting much attention to this part of the Slocan, about which more information will be given later, probably for the next number of the "Journal." In passing it may be mentioned that it has lately been reported that another important shoot of ore has been found in the Van-Roi Company's mine, and that the Silverton Mines, Ltd., has had the misfortune to be deprived of the use of the Wakefield concentrating mill, held on lease, but lately destroyed by fire. There is little to note concerning operations in Slocan City division, in which the Eastmont, Enterprise, Meteor, Lily B., and other properties are being worked.

NELSON MINING DIVISION may be expected to increase its output of ore during the latter half of the year, for one or two mines in Ymir camp will probably ship, while in Sheep Creek camp the Mother Lode 10-stamp mill will be regularly operated, as well as that at the Queen. Production reports published recently

not show much lead ore to be coming from this vision now. Near the City of Nelson, the Granite-oorman group is understood to be doing better, from financial point of view, than last year. It is reported at the British Columbia Copper Company is negotiing for a working bond on the Eureka copper mine. Only brief mention may now be made of Rossland ines, leaving these for more notice next month, after ıey shall have been visited. Rossland camp is stated be generally in a sound condition, the Centre Star roup and Le Roi No. 2 Company's mines both well-aintaining their customary output of ore of profit-ielding grade. The Le Roi, now that it is being orked by the Consolidated Mining and Smelting ompany, is sending out more ore, its production this ear to July 1 having reached a total of nearly 25,000 ons. In the South Belt progress is also being made.

BOUNDARY.—The Granby Consolidated M. S. and . Co. shipped from its own mines to its smeltery at rand Forks during the seven months of its last fiscal ear (ended June 30, 1912); it was operating approxiıately 732,000 tons of ore, and produced about 13,-00,000 lbs. of blister copper. Foreign ore receipts otalled about 19,000 tons. The British Columbia Copper Company, beside keeping its Mother Lode and Rawhide mines producing at about full capacity, has esumed work on its Napoleon and Lone Star mines both in the neighbouring State of Washington). It ıas closed its Wellington camp mines, but lately reumed development of the L. H. mine, near Slocan, ınd has a number of men and five diamond drills at work on the Voigt property and some neighbouring laims in Similkameen district.

Outlook for Metalliferous Mining.

The improved outlook for metalliferous mining in British Columbia is emphasized by the fact that several mining companies are now dividend-paying, while there is reasonable prospect of two or three others becoming so ere long. Not for years has this province made a similarly good showing as the following for about six weeks, June 9 to July 15, both dates inclusive:

1912.	Amount of Dividend.
June 9, dividend of $2\frac{1}{2}$ cents a share on 2,000,000 shares paid by the Standard Silver-Lead Mining Company.	$ 50,000 00
June 29, dividend of 50 cents a share of 120,000 issued shares paid by the Hedley Gold Mining Co'y.	60,000 00
July 1, dividend of 1 shilling a share on 120,000 shares paid by the Le Roi No. 2, Ltd., £6,000, or say.	29,400 00
July 9, dividend of $2\frac{1}{2}$ cents a share on 2,000,000 shares paid by the Standard Silver-Lead Mining Company.	50,000 00
July 15, dividend of 15 cents a share on 591,709 shares paid by the British Columbia Copper Co., Ltd.	88,756 35
Total.	$278,156 35

The foregoing statement by no means shows the total of earned profits—only the production that quite recently has been divided among the shareholders in the several companies shown on the list. It is well tively large profits, with copper at the average price of the last few months, while it is understood that the present policy of the directors is to use these gains for the development and equipment of the company's Hidden Creek mines, though there is a possibility of there being dividend payments later in the year. The directors of the British Columbia Copper Company are authoritatively stated to have said, when announcing their intention to pay Dividend No. 4 in July: "The company has in hand a full year's dividend at the rate declared to-day, and is earning at the rate of more than 25 per cent. annually on the par known that the Granby Company is making comparavalue ($5) of its shares." This means that net profits are at the rate of about $750,000 a year. As to the Standard Silver-Lead Company—the directors make no secret of their expectation to maintain payment of a monthly dividend totalling $50,000, so long as silver and lead prices shall keep up to their present level, for there are large reserves of ore of good grade in the Standard mine. Then, there is the steadily improving financial position of the Consolidated Mining & Smelting Co. of Canada, Ltd., the seventh annual report of which—for the fiscal year ended June 30, 1912—will no doubt be made public about two months hence. While this may be expected to show that the total tonnage from the various mines owned or leased by the company was considerably less than in the immediately preceding fiscal year, prices of metals other than gold averaged higher during the last fiscal year—silver about $2\frac{1}{2}$c. an oz., lead about £2 10s a ton, and copper about $2\frac{1}{2}$ cents a pound higher for the whole year. The Britannia Mining and Smelting Company, is also stated to be making substantial profits, with an abundant supply of ore of good average grade and copper at a higher price. The heavy outlay period for the Rambler-Cariboo Mines, Ltd., appears to be drawing to a close, and it is confidently expected that the last quarter of the current year will see this company making much profit. Other silver-lead and zinc mines in Slocan and Ainsworth divisions will probably earn money above working expenses, while in Nelson division the Granite-Poorman group is stated to be now making a profit, the Quee gold mine is doubtless doing well, and it is expected the Mother Lode Sheep Creek Mining Company will be dividend-paying in the late autumn. There is no known reason to suppose that the Hedley Gold Mining Company's total net earnings for 1912 will be less than for 1911, in which latter year the net profit on its gold mining and milling operations was $308,802, and its total of dividends distributed $300,000, or 25 per cent. on its issued capital of $1,200,000.

In the foregoing rapid survey of the profit-earning condition of the chief producing metalliferous lode mines of the province, it is probable some have been overlooked, besides which no mention has been made of placer-gold mines, several of which should make an excellent showing this year, especially if sufficient rain shall fall in the autumn to lengthen their gravel-washing season.

It will be observed that this review of the position takes into account only metalliferous mines. What the year's results will be as regards coal mining is not plainly apparent, so a forecast may not now be made. But, leaving out of account the profits that it seems reasonable to conclude some of the coal-mining com-

COMPANY NOTES

MINTO COAL CO., LTD.

This company was formed in July, with a capital of $400,000, to take over coal interests acquired during the past few months by Sir Thomas Tait, in Queen's and Sunbury districts, Grand Lake district, New Brunswick.

Nipissing's Position.

The position of the Nipissing Mines Company on July 6th was the strongest in its history up to date. It had a surplus of $1,525,898, of which $1,173,000 was in cash. Half of the low-grade mill, to cost $275,000, has already been paid for by the earnings.

La Rose Finances.

On July 1st, the financial position of La Rose Consolidated Mining was as follows:—

Cash in bank, ore in transit and at smelters	$1,611,830.03
Ore sacked at mine ready for shipment...	105,880.01
	$1,717,710.04

Temiskaming Board.

A special general meeting of the Temiskaming Mine Company, Limited, has been called for Monday, July 29th, for the purpose of ratifying a by-law passed by the directors increasing the number of directors from five to seven.

Timiskaming Makes Half-Yearly Statement.

Directors of the Temiskaming mine are sending out the half-yearly statement showing the condition of the company at the end of the half-year. The principal items compare with the corresponding figures at the end of 1911 thus:

Cash on hand	$299,612	$100,442
Due from smelters	114,940	158,708
Ore on hand	44,874	28,555
Accounts receivable	55,709	11,770
Insurance and taxes earned..	6,197	1,300
	$521,332	
Less June pay-roll	33,327	
	$488,005	

Less balance deferred payments North Dome stock, $150,000; balance, $373,005.

COBALT DIVIDENDS.

Dividends paid by the Cobalt mines for the first six months of the year shows a net loss of but $8,376 in comparison with the first six months of the previous year, and as the gains are to all intents permanent and the losses temporary or long ago discounted, the report is better than its face value would appear. The payments in the last six months were:

	Per cent. of issued capital.	Amount paid.
Beaver	3	$ 59,892
Buffalo	16	160,000
Townsite	15	150,000
Coniagas	15	690,000
Crown Reserve	30	530,640
Hudson Bay	900	69,849
Kerr Lake	10	300,000
La Rose	4	337,500
McKinley-Darragh	20	224,[illegible]
Nipissing	15	900,000
Temiskaming	3	75,000
Trethewey	10	100,000
Wettlaufer	10	70,825
		$1,578,[illegible]

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Ore shipments from Cobalt camp last week were 864,168 pounds or 432 tons divided among nine mines in addition to which there were four bullion shippers. Shipments for week and year in pounds of ore are:—

	Week to July 1910.	Year to date.
Beaver	......	361,756
Buffalo	56,371	1,367,174
Can. Gowganda	......	15,967
Casey Cobalt	......	929,498
Chambers-Ferland	63,400	524,900
City of Cobalt	......	291,712
Cobalt Lake	115,100	798,299
Cobalt Townsite	86,000	1,692,363
Colonial	......	83,200
Coniagas	......	2,085,582
Crown Reserve	......	661,971
Drummond	......	682,595
Hudson Bay	......	817,592
Kerr Lake	......	839,080
La Rose	155,273	3,917,209
Lost and Found	......	30,001
Mann (Gowganda)	......	40,[illegible]
McKinley	132,731	2,981,[illegible]
Millerett		130,000
Miller Lake-O'Brien	......	146,[illegible]
Nipissing	150,087	2,442,[illegible]
O'Brien	......	589,[illegible]
Provincial	......	44,440
Right of Way	53,100	343,[illegible]
Temiskaming	62,106	1,215,[illegible]
Trethewey		545,972
Wettlaufer	......	216,470
Totals	864,168	23,861,187

B. C. ORE SHIPMENTS—WEEK ENDING JULY 13, 1912.

Although below the previous week's record total of over 50,000 tons, the ore production for the Kootenay and Boundary district last week was well above the average for the year and some thousands of tons above the average weekly production in 1911. Last week the output was 46,420 tons, making the total for the year to date 1,223,158 tons. The smelter receipts for the

[illegible]k were 43,218 tons; for the year to date, 1,141,359 [illegible]s.

[illegible]wo properties, the Lucky Boy, near Erie, and the [illegible]erald, the well known Sheep creek silver-lead pro[illegible]er, at which extensive development is being carried [illegible] this summer, returned to the shipping list.

[illegible]mong the Boundary mines the Lone Star made a [illegible] showing with a shipment of 664 tons, against 165 [illegible]s for the previous week.

[illegible]he Monarch mine, near Field, B.C., which has been [illegible]rating its mill steadily for some months, made a [illegible]ord shipment of 72 tons to the Trail smelter. W. J. [illegible]n Houten and associate of Vancouver are heavily [illegible]erested in this property.

[illegible]re production in detail was:

Boundary.

Granby	23,846	634,564
Mother Lode	7,038	200,716
Napoleon	171	2,061
Rawhide	5,619	110,887
Lone Star	664	829
Unnamed	594	6,223
Surprise	307	1,556
United Copper	53	424
Middleton	14	38
Total	37,706	987,682

Rossland.

Centre Star	3,498	84,554
Le Roi	585	26,070
Le Roi No. 2	232	14,801
Le Roi No. 2, milled	300	8,200
Other mines	...	79
Total	4,706	133,704

Nelson.

Granite-Poorman, milled	250	7,250
Emerald	32	865
Granite-Poorman	29	189
Molly Gibson	16	1,328
Lucky Boy	8	27
Silver King	5	25
Widdowson	1	1
Queen, milled	300	6,300
Mother Lode, milled	350	2,050
Molly Gibson, milled	300	2,100
Other mines	...	4,533
Total	1,291	24,668

East Kootenay.

Sullivan	620	17,155
Monarch	72	494
Monarch, milled	200	5,200
Other mines		1,423
Total	892	24,272

Slocan and Ainsworth.

Standard	199	4,801
Rambler-Cariboo	35	711
Richmond-Eureka	21	763
Van-Roi	31	1,583
No. 1.	29	481
Standard, milled	400	8,600
Van-Roi, milled	1,100	32,800
Other mines	...	3,084
Total	1,825	52,832

Consolidated Co.'s Receipts.
Trail, B.C.

Centre Star	3,498	84,554
Sullivan	620	17,155
Le Roi	585	26,070
Le Roi No. 2	323	14,801
Surprise	307	1,556
Standard	199	4,801
Monarch	72	494
United Copper	53	424
Rambler-Cariboo	35	711
Van Roi	31	1,583
Emerald	32	865
Granite-Poorman	29	189
Richmond-Eureka	31	763
No. 1	29	481
Middleton	14	38
Molly Gibson	16	1,328
Lucky Boy	6	27
Widdowson	1	1
Silver King	5	25
Other mines	..	5,206
Total	5,886	161,072

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	23,846	654,564

B. C. Copper Co.'s Receipts.
Grand Forks, B.C.

Mother Lode	7,038	200,716
Napoleon	171	2,061
Rawhide	5,019	110,887
Lone Star	664	829
Unnamed	594	6,223
Other mines	....	5,007
Total	13,486	325,723

COAL MINING AT DEPTH.

Replying to the toast of "The Institution of Mining Engineers," at the annual dinner of that society last month, the President, Mr. W. E. Garforth, said that the two great difficulties the coal miner had now to face were those of superincumbent weight and increased temperature. In the past, fears had been expressed that it would be impossible to work at greater depth than 1,500 feet; but coal was now being won in several instances at depths exceeding 3,000 feet. The principal remedy in combatting superincumbent weight had been the adoption of the system of long-wall working with rapid development of the faces, so that the coal was exposed to the weight for a very short time and places could be closed rapidly. Weight was Nature's lever, and might be utilized in ways not anticipated some few years ago. Reverting to the question of temperature at depth, he said men were working to-day in temperatures of over 90 degrees; but if advantage was taken of scientific knowledge, this temperature might be reduced. Thus, by the employment of apparatus somewhat on the principle of the Green's economizer and circulating fluid, air might be considerably cooled to admit of the mining of coal at much greater depths than those regarded by the Royal Commission as constituting the limit.

MARKET REPORTS

TORONTO MARKETS.

July 13—(Quotations from Canada Metal Co., Toronto):

Spelter, 6.30 cents per lb.
Lead, 5¼ cents per lb.
Antimony, 8 to 9 cents per lb.
Tin, 46½ cents per lb.
Copper, casting, 18 cents per lb.
Electrolytic, 17¾ cents per lb.
Ingot brass, 7 to 12 cents per lb.

July 23—Pig Iron (Quotations from Drummond, McCall & Co., Toronto):

Summerlee No. 2, $23.50 (f.o.b. Toronto).
Midland No. 1, $19.75 to $20.50 (f.o.b. Toronto).
Midland No. 2, $19.75 to $20.50 (f.o.b. Toronto).

General.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

July 19—Connellsville Coke (f.o.b. ovens)—

Furnace Coke, prompt, $2.25 to $2.50 per ton.
Foundry Coke, prompt, $2.50 per ton.

July 19—Tin, Straits, 43.55 cents.

Copper, Prime Lake, 17.37½ cents.
Electrolytic, Copper, 17.37½ to 17.50 cents.
Lead, 4.75 cents.
Spelter, 7.25 cents.
Sheet zinc (f.o.b. smelter, 8.75 cents.
Antimony, Cookson's, 8.25 cents.
Aluminium, 23.00 to 23.25 cents.
Nickel, 40.00 to 41.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $47.00 per ounce.
Bismuth, $1.80 to $2.00 per lb.
Quicksilver, $42.50 per 75-lb. flask.

SILVER MARKETS.

July 6	61	28 1/16
July 8	60¾	27 5/16
July 9	60⅞	28
July 10	61	28 1/16
July 11	60¾	27 15/16
July 12	60¼	27¾
July 13	60¼	27¾
July 15	60¼	27¾
July 16	60/	27⅞
July 17	60⅝	27⅞
July 18	60⅝	27⅞
July 19	60⅜	27 13/16

SHARE MARKETS.

(Courtesy of J. P. Bickell & Co.)

New York Curb.

	Bid.	Ask.
Braden	7.12½	7.50
B. C. Copper	5.37½	5.62½
Giroux	4.87½	500
Greene Cananea	9.87½	10.00
Inspiration	19.00	19.25
Yukon Gold	3.62½	3.87½
Goldfield Con.	3.87½	4.00
Nevada Con.	20.25	20.50
Miami Copper	29.62½	29.75
Ray Con.	20.75	20.87½
Chino Con.	31.50	32.25
United Copper	.50	1.00

Cobalt Stocks.

Bailey	1⅞	2¼
Beaver	43	44
Buffalo	140	150
Chambers-Ferland	17	18
City Cobalt	19	20½
Coniagas	720	780
Crown Reserve	325	345
Gerat Northern	7	9
Gould Con.	..	1½
Gifford	3¾	4½
Green-Meehan	1	1⅛
Hargraves	4½	6
Kerr Lake	270	300
La Rose	303	310
McKinley	175	177
Nipissing	750	790
Ophir	8	10
Otisse	1¼	1¾
Peterson Lake	6¾	7½
Right of Way	4½	6
Silver Leaf	3¾	4½
Silver Queen	3	4
Temiskaming	37	39
Trethewey	47	51
Wettlaufer	57	60

Porcupine Stocks.

Apex	..	3
Dobie	10	25
Crown Charter	9½	10½
Dome Extension	14	14½
Eldorado	1	4
Foley O'Brien	12½	18
Hollinger	1225	1250
Jupiter	28	31
Moneta	7	10
North Dome	25	100
Pearl Lake	17¾	19
Porcupine Imperial	1½	2
Porcupine Tisdale	1⅞	2
Preston East Dome	1½	2
Rea Mines	28	35
Standard	½	1½
Swastika	10	10¾
Vipond	32	34
United	1	2
West Dome	5	15

Sundry.

Island Smelters	3½	4½
Canadian Marconi	475	625
American Marconi	825	[illegible]

The returns of the United States' Bureau of Mines show that 2,517 persons, or 0.391 per cent. of the number employed, were killed in coal mine accidents in the United States during the year 1911. Of these fatalities, 48 per cent. were caused by falls of roof and falls of coal other than roof coal, and 14.14 per cent. only from gas and dust explosions. So far the Canadian returns, as a whole, are not yet available. The returns from Nova Scotia, however, indicate that the death rate from mine accidents last year was below that of the United States to the extent of one per thousand. Of the fatalities there 33.3 per cent. were caused by fall of coal or rock, and 22.2 per cent. to explosion of gas.

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Converters—
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Jenckes Machine Co .
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Cranes—
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Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.

Crushers—
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Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Waterous Engine Co.
Chalmers & Williams.

Cyanide Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.

Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers, Drafting Materials.
John Davis & Sons.
A. L. Berger.
Peacock Bros.

Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

Dredging Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

Driers—
Jeffrey Mfg. Co.
Mussens, Limited.

Drills, Air and Hammer—
Canadian Rand Co.
Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Canadian Rand Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.

Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

Dynamite—
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Jones & Moore Electric Co., Ltd.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Ejectors—
Mussens, Limited.
Peacock Bros.

Elevators—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian Iron Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

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Mussens, Limited.

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W. F. Stanley & Co.
Peacock Bros.

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Fraser & Chalmers, Ltd.

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Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.

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Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

Engines—Haulage—
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.

Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

Engines—Oil—
Jenckes Machine Co.
Peacock Bros.

Engines—Steam—
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

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E. Leonard & Sons.
Jenckes Machine Co.

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Sullivan Machinery Co.
Jeffrey Mfg. Co.
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John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
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Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

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Canadian Miner's Buying Directory.—(Continued from page 34.)

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B. Greenings Wire Co., Ltd.
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Sullivan Machinery Co.
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Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

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Canadian Rand, Ltd.
Can. Cleveland Drill Co.

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Allis-Chalmers-Bullock.
Jenckes Machine Co.

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Fraser & Chalmers, Ltd.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Incandescent—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
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Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

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John Davis & Sons.
T. Eaton Co.

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Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
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Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse.

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Mica Dealers—
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Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

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Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
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Siemens Brothers. Dynamo Works, Ltd.
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Fraser & Chalmers, Ltd.

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Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
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Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

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Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

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Can. Cleveland Drill Co.
Canadian Rand Co.
Peacock Brothers.
Jones & Glassco.

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Can. Fairbanks-Morse Co.
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Can. Fairbanks-Morse Co.

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Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Centrifugal—
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Fraser & Chalmers, Ltd.

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Pumps—Rotary—
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Pumps—Sinking—
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John McDougall Caledonian Iron Works, Ltd.

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E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

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Smart-Turner Machine Co.
Canada Foundry Co.
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Sullivan Machinery Co.
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Wetherill Magnetic Separating Co.

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Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
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Canadian Rand Co.
Peacock Bros.
Edgar Allen & Co.

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Can. Steel Foundries.

Steel—Tool—
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Peacock Bros.
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Chalmers & Williams.
Fraser & Chalmers, Ltd.

Turbines—
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Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
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John McDougall Caledonian Iron Works, Ltd.
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John McDougall Caledonian Iron Works.
Jenckes Machine Co.

Wheels—
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Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Canadian Rand Co.
Fraser & Chalmers, Ltd.
E. Leonard & Sons.
Siemens Brothers. Dynamo Works, Ltd.

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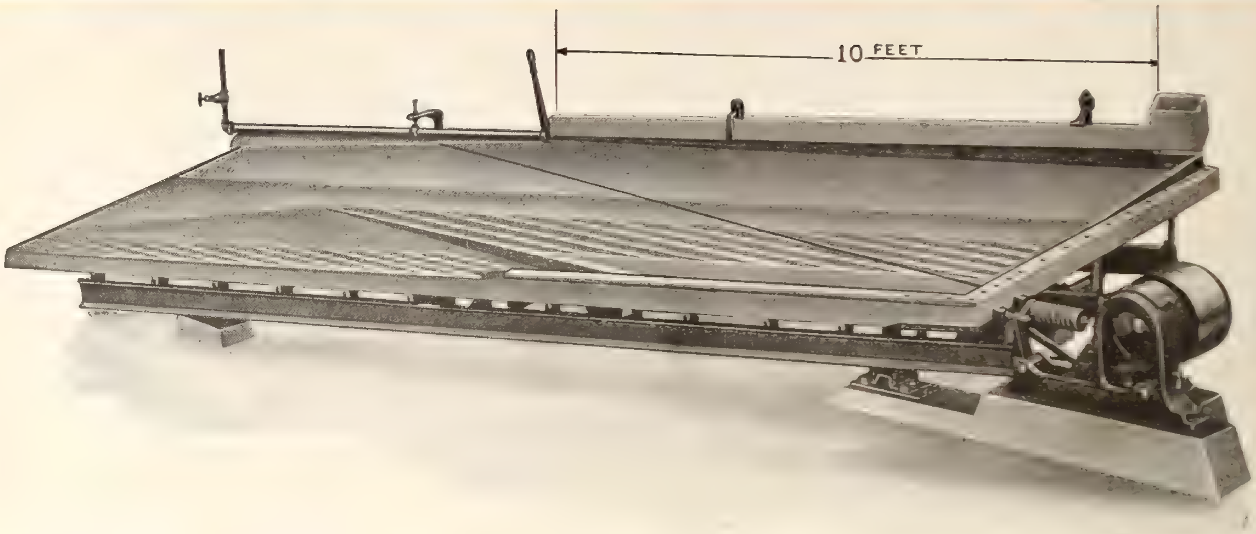
Wire—Magnet
Standard Underground Cable Co. of Canada, Ltd.

Wire—Railway
Standard Underground Cable Co. of Canada, Ltd.

Zinc Dust—
Roessler & Hasslacher.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.. 33 TORONTO No. 16

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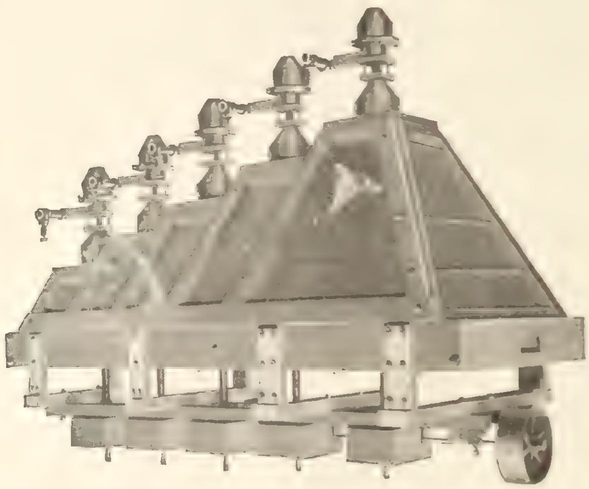
1. Close hindered settling classification.
2. Low water consumption.
3. Flexibility in capacity.
4. Non-dilution of slimes.
5. Low maintenance costs.
6. Adaptability to changing load.



Standard Five Compartment Classifier

A Table of Comparative Results Obtained From Tests of Richards-Janney Classifiers

The total gallons per ton obtained in the following table is the sum of the spigot discharge per ton and the gallons overflow per ton, rather than the amount entering per ton plus the amount injected per ton.

Classifier	Tons Handled	Maximum Mesh	[illegible] Bushings	[illegible] per ton	[illegible] injected [illegible]	[illegible] per ton	[illegible] overflow per ton	[illegible]
Screen Primary	450	6	[illegible]	225	[illegible]	361	[illegible]	[illegible]
Mill Primary	757	20	1¼, 1 [illegible]	[illegible]	[illegible]	189	[illegible]	[illegible]
Third Compartment Secondary	233	30	[illegible]	824	[illegible]	[illegible]	[illegible]	[illegible]
Fourth Compartment Secondary	310	40	[illegible]	[illegible]	486	[illegible]	[illegible]	[illegible]

The above table of tests shows an extremely large capacity and low water consumption and screen analyses show close classification and distinctive separation of slimes from sands. As this kind of work is the basis of successful mill operation, the installation of such a machine would prove the solution of nine out of ten of the seemingly difficult problems in ore dressing.

For further information, see Bulletin No. 1800.

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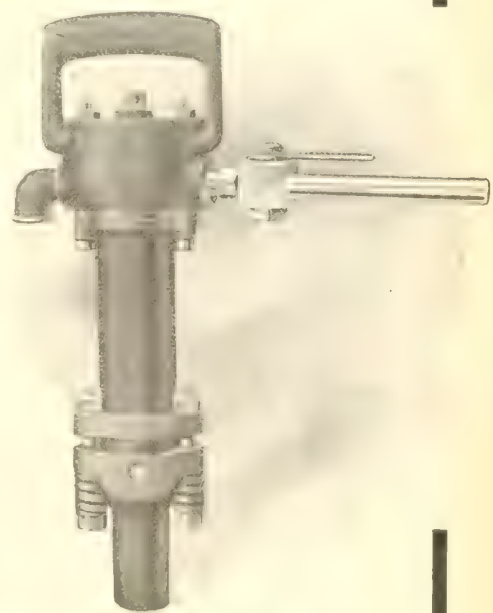
For Shaft Sinking, Block Holing and in fact practically every form of Down Hole Drilling these tools are enormous LABOR savers as well as great economizers of POWER, TIME and REPAIRS.

LABOR is by far the most expensive of these four items and as it only requires one man to run a Butterfly Valve Hammer Drill, the cost of labor is cut in half.

POWER is another important factor and in a recent test with a couple ot "BC-26" Butterfly Valve Hammer Drills against two **$3^1/_8$ inch** Piston Drills, the saving of power was 36% in favor of the Hammer Drills.

The use of materials suitable for each particular part and simplifying design has reduced the cost of UP-KEEP to a minimum.

The fact that there is no setting up and tearing down means a great reduction in TIME in drilling a number of holes.



"B C-26" Hammer Drill with Combined Rotating Handle and Throttle

¶ The "BUTTERFLY VALVE" is a device which is used solely by the INGERSOLL-RAND CO. in their HAMMER DRILLS and is of such construction that instead of wearing loose it increases in efficiency as the tool is used.

¶ The SAVING effected by using the "BUTTERFLY VALVE" HAMMER DRILL in place of Piston Drills in the test mentioned above would pay for one drill in less than three days.

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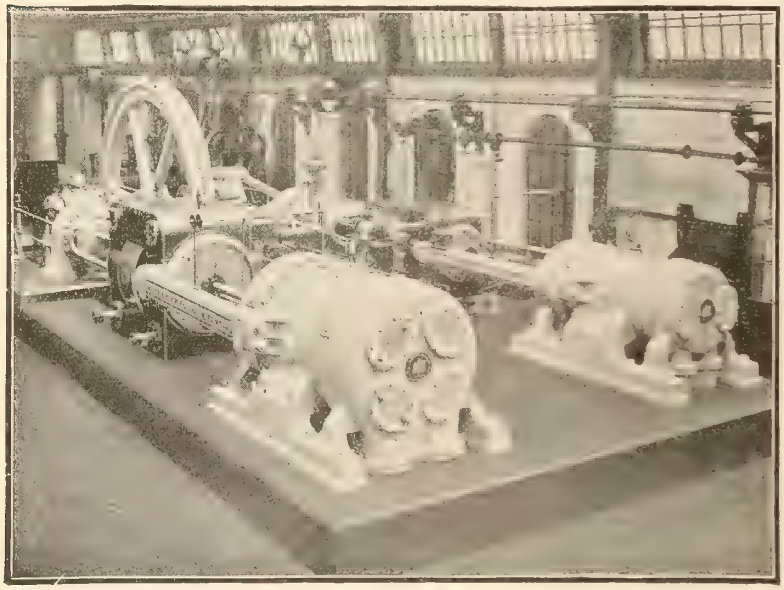

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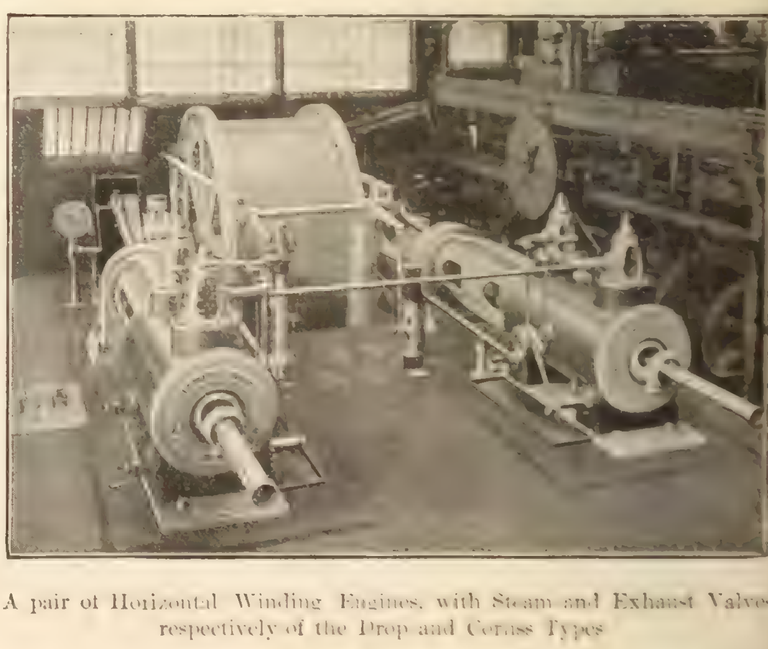

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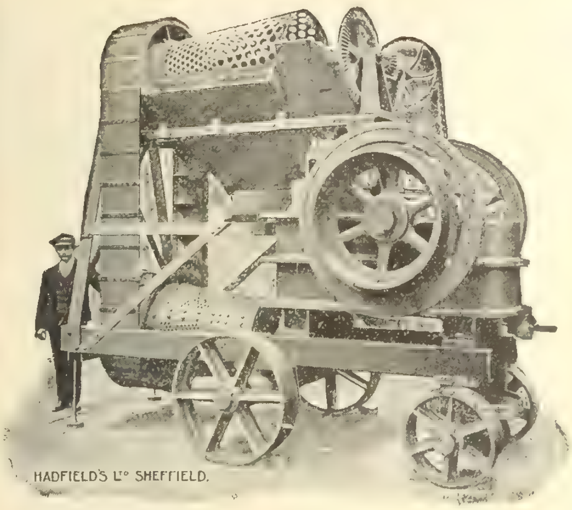

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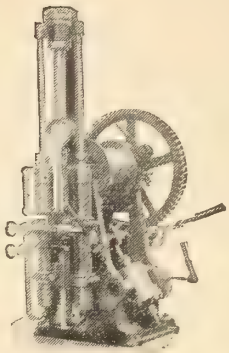

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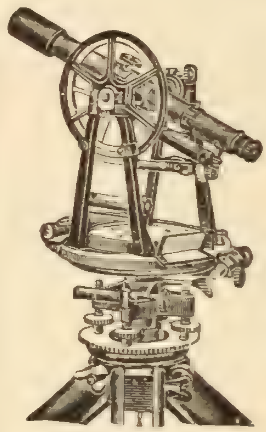

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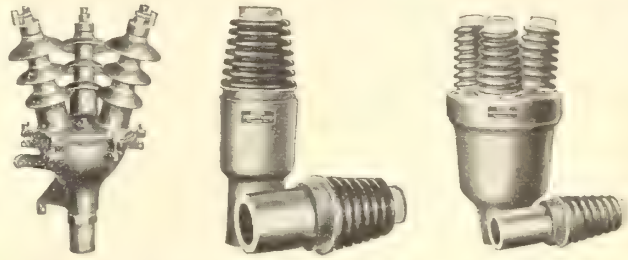

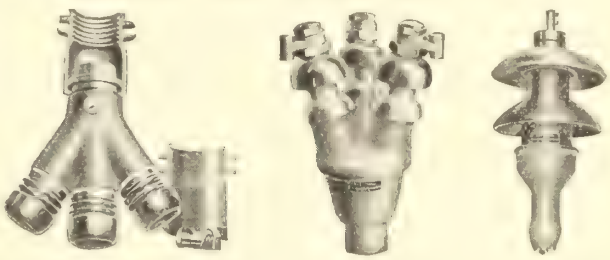

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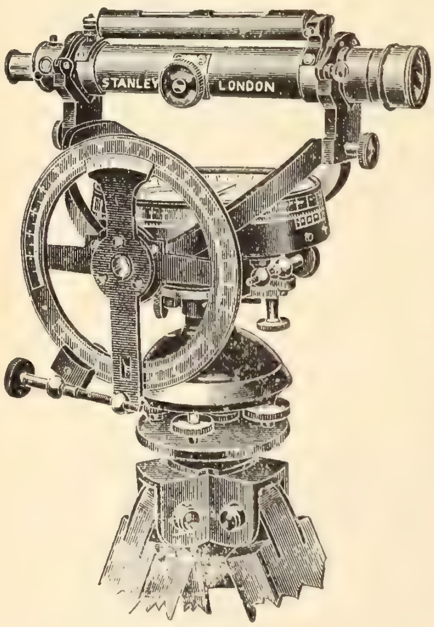

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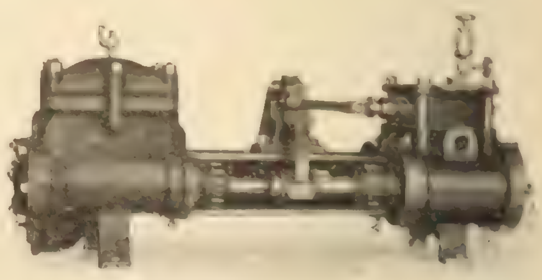

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THE CANADIAN MINING JOURNAL

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CONTENTS.

THE GAS FIELDS OF NEW BRUNSWICK

Rarely in the history of Canada has there been such an addition to the wealth and potentialities of a large settled area as in the case of the region centering in Moncton, New Brunswick.

It may be well first to glance at the geographical situation of Moncton. The city has its site in the rich valley of the Petitcodiac River, a large tidal stream flowing into Chignecto Bay, which is an arm of the Bay of Fundy. Easy harbourage for large steamers is available on the river during most of the year. As a railway centre Moncton is easily the most important in Eastern Canada. Its manufactures are growing rapidly, and it is surrounded by a singularly fertile farming and fruit-raising country.

St. John lies 90 miles to the west; Sackville, about 40 miles south; Amherst, one of the most flourishing manufacturing towns in Nova Scotia, 38 miles in the same direction; whilst the distances to Truro, New Glasgow and Pictou do not exceed 150 miles. All these towns are on the Intercolonial Railway system, and that system has its headquarters in Moncton. In all of these towns, also, new and important manufacturing enterprises have sprung up of late and are being organized to such an extent as to indicate a strong industrial revival.

From even this meagre outline, it will be seen that the discovery of natural gas in the vicinity of Moncton (under such conditions, and in such quantity as to warrant fully the statement that the supply is fully adequate to any demand that may arise for years to come) is fraught with enormous significance.

The present available supply measures about 60,000,000 cubic feet of gas per day. This amount can be obtained, under natural pressures ranging from 200 to 600 pounds per square inch, from 17 wells drilled within an area of three square miles. Incidentally, the rights of the owners extend over 10,000 square miles, much of which is probable or possible territory. At present gas has been piped to Moncton where it is consumed to the extent of about 2,000,000 cubic feet per day. Even the casual visitor is impressed with the metamorphosis that Moncton has undergone since this event. The gas is used by the consumer at a pressure of less than 10 ounces. The prices per thousand cubic feet are less than half those obtaining in other cities. The gas itself is clean and of very high calorific value.

In a forthcoming issue we shall devote a considerable amount of space to this new field, and to its bearing upon the Maritime Provinces. Here we mean

merely to remind our readers of its existence. But we cannot close without reference to the indomitable pluck, patience, and farsightedness of the man who first exploited the field, and whose sagacious leadership is bringing the whole enterprise to a successful issue. That man is Mr. Mathew Lodge. Not only has Mr. Lodge brought this boon to Moncton, but he has done much in other directions to assist the community in which he lives. The manufacturer will be enriched by Mr. Lodge's work; the farmer will cut his fuel bill in half or in quarter; but, best of all, the weary housewife will rise up and call him blessed. And, by the same token, we hope that Mr. Lodge and his associates will always make it their policy to favour strongly the domestic consumer.

A PORTFOLIO OF MINES AT OTTAWA.

From Ottawa has lately come news, unofficial as yet but bearing in form some family resemblance to politic newspaper "feeler." It is to the effect that the Dominion Government, during the forthcoming session, is to create a separate Portfolio of Mines. This implies, of course, that one responsible Minister will assume all the duties of the Department and will devote all of his time to those duties. Not only has the Canadian Mining Institute formally urged this change, not only has *The Canadian Mining Journal* repeatedly expressed the conviction that the present condition of affairs could not be continued without injury to the country, but the mining public has long recognized that things administrative at Ottawa were specifically wrong as regards mining. Therefore, we believe that the creation of the new Portfolio will be welcomed without a dissentient voice. And we further believe that the Hon. Mr. Rogers will breathe a sigh of relief at being freed from departmental details that cannot be otherwise than burdensome to a Minister already loaded to capacity.

The Dominion Government may safely take it for granted that no step could meet with more wholesale approval. They may also take it for granted that any objections raised should be totally disregarded.

Mining is the second industry of Canada. Verbum sap.

NOVA SCOTIAN COAL OUTPUTS.

Never has the coal trade of Nova Scotia been in a more encouraging condition. Comparing the first half of the year 1912 with the corresponding period in 1911, we find that the Dominion Coal Company, which is by far the largest shipper, has shipped 248,645 tons more this year than last. At the end of June, 1912, the company's shipments amounted to 1,819,089 tons; last year the total was only 1,570,444 tons. These figures do not include the output of the Springhill collieries, now under the control of the Dominion people, where the shipments have been brought up from 45,893 tons, to 176,622 tons, an increase of 130,729 tons.

At the Inverness mines a small advance is recorded—132,331 tons this year, as compared with 130,992 tons last year. The Nova Scotia Steel and Coal Company reports a gratifying advance of 58,509 tons — 327,210 tons this year, as against 268,701 tons last year.

On the other hand the Acadia Coal Company and the Intercolonial Coal Company have failed to reach last year's figures, the decreases being, respectively, 12,051 tons and 16,228 tons. The net increase, exclusive of several smaller collieries not referred to, therefore, during the first six months of this year is 410,943.

At this rate of growth Nova Scotia's output of coal during 1912 will come close to 8,000,000 tons, whereas last year it was less than 7,000,000 tons. An expansion of 12 per cent. is remarkably healthy.

As indicating future possibilities, the feasibility of shipping fuel from Sydney to Toronto to supply the pressing needs of certain civic departments, is being discussed.

PUBLICITY FOR THE GEOLOGICAL CONGRESS.

Widespread advertisement is being given the Toronto Meeting of the Twelph International Geological Congress, to be held here in August, 1913. In referring to this meeting, the Financial Times, London, urges upon its readers the importance of the event, and alludes very pleasantly to Canadian hospitality.

Apart from such newspaper notices, the publicity that each Canadian mining man can give the Congress is needed. Individual and personal interest must be roused and sustained. The Government and the railway corporations are doing their duty nobly. To supplement the support thus vouchsafed, every member of the Canadian Mining Institute should be a walking advertisement of the Congress. The Toronto Meeting and the numerous excursions may be rendered the most effective stimulus possible for the mining industry of Canada.

THE COALFIELDS OF ALBERTA.

Commenting on Mr. D. B. Dowling's estimate of the quantity of coal available in the coalfields of Alberta, Mr. E. H. Cunningham Craig, in an article to the Mining Journal, thus points out that with such sources of wealth lying ready to hand, it is astonishing that so little development work has been undertaken. Two points become at once apparent to the investigator who is searching for some explanation of this condition of affairs. The first is that the coals seem to have been worked only where they actually appear at the outcrop. There are large untouched areas where fuel of the highest quality can be proved to exist, areas lying directly between successful mines and traversed by main lines of railways, and yet no attempt has ever been made to develop them, simply because a covering of drift or gravel masks all the solid strata, and no coal seams are visible to attract the enterprising prospector. The first mining ventures are often, it is to be feared, conducted in an amateur fashion. Thus the second point: that in many cases a penny-wise and pound-foolish policy has

been followed in the development of mining propositions. An instance is cited whereby an excellent mine was ruined by the manner in which the shallow workings were exploited and pillars robbed with the idea of winning coal cheaply and at a large immediate profit, regardless of the future. There are unquestionably many such examples. Mr. Craig remarks that such short-sighted policy has doubtless done much to cast discredit upon the coal mining industry in Alberta, and even now, with efficient supervision and inspection of mines by trained officials, the fear may still lurk in the minds of investors that the life of coal mines in Western Alberta may be precarious and not of long duration. This may very naturally have deterred the employment of British capital in opening up the coalfields. It may, however, be affirmed that there are now a sufficient number of mines, developed on scientific lines, while others are also being opened, to provide for market requirements for some time to come, notwithstanding the remarkable industrial expansion that is taking place and the consequent increasing demand for coal. Nevertheless, Mr. Craig's conclusion that the fuel resources of the country must not be regarded as an asset merely of importance to the province, is sound. There are, he states, a national and even an Imperial source of power and energy, and their exploitation is in the interests of the Empire as a whole, providing a field for very considerable capital; for the time will come when the export of the better qualities of steam coal will inevitably become a factor in the mining industry. Then the Imperial value of the coalfields will be obvious.

A. I. M. E. AFFAIRS.

The report of the Committee appointed at the last annual meeting of the American Institute of Mining Engineers to investigate the affairs of that society and pronounce, in particular, concerning certain constitutional changes submitted for consideration, has just been issued. The committee reports that there has been a considerable annual deficit, representing an expenditure of tow thousand dollars over net income (or of nearly ten thousand dollars, taking into account the payment of the Institute's indebtedness towards the purchase of the office site in New York if met in annual instalments); and they recommend, in consequence, the adoption of a policy of economy and retrenchment "to make the budget of the Institute, all financial obligations of whatever nature included, balance." This course is advocated in preference to the proposal that the annual fees be increased from ten to fifteen dollars per annum, which, among other amendments to the society constitution submitted at the annual meeting in February, was the subject of controversy. The committee further recommends that the proposal to reclassify retroactively the present membership be negatived, "leaving any reclassification of membership for a more careful consideration later on." Other recommendations include, the copyrighting of all papers accepted and printed; and the removal from the membership list of the names of "delinquent members after twelve months' delinquency."

Apropos of the above it may be noted that the Canadian Mining Institute has, of late, been obliged to face problems of a very similar nature. So far, however, it has managed to make both ends meet comfortably enough; but in the last two years the prices of printing have increased so enormously that retrenchment in certain directions has become imperative. To accomplish this without loss of efficiency or effectiveness has, no doubt, been the question the Council has been called upon to decide; and according to an announcement appearing in the last issue of the Bulletin, the solution of the difficulty has taken the form of a change in the method heretofore in force of publishing the transactions. In future the publication of papers in both preliminary and final printings will be discontinued in favour of the system long followed by the Institution of Mining Engineers of Great Britain, and of also, we believe, the Iron & Steel Institute, of publishing an annual volume of transactions in a series of sections or parts at intervals throughout the year. The change will, of course, represent a considerable saving, while at the same time it inflicts no hardship on members, who as now will be given the opportunity of securing, in addition, a bound copy of the completed volume at the end of the year for a nominal sum.

VENTILATION IN RAND MINES.

In the larger mines on the Rand ventilation is being given much attention. Eleven large fans, three of which are of the Rateau type, and eight of the Sirocco type, are installed in the mines of the Central Mining group. The diameters of the fans range from 35 to 126 inches; the capacities being from 25,000 to 288,000 cubic feet of air per minute. The general introduction of spraying also tends to improve workings conditions.

THE ABSORPTION OF GOLD BY AMALGAMATED COPPER PLATES.

A discussion of the absorption of gold by amalgamated copper plates has appeared recently in the transactions of the Chemical, Metallurgical and Mining Society of South Africa. In it are some facts and suggestions that deserve notice.

In explaining away poor preliminary mill-runs, the fact that plates do not absorb gold is often unduly accentuated. The corresponding fact that discarded plants, or portions of these plants, contain quantities of recoverable gold that is not available during ordinary operation, is more or less overlooked.

One case is instanced where plates that had been in use for two and a third years were "sweated" and "scaled" and 12.64 ounces per plate recovered. There remained in one plate, after "sweating," about 45.75 ounces.

It is suggested that, as the plates were originally set with silver amalgam, the original silver amalgam scale

must become worn off and replaced by gold. This seems to be obviously the case. But it is also the case that the use of silver amalgam modifies the absorption of gold, especially during the earlier life of the plate.

The mercury coating the bottom of a plate, on examination was found to carry about 0.10 per cent. of gold. The solubility of gold in mercury is about 0.12 per cent. Hence it is possible that this gold was carried through in solution.

The dry scraping of plates is not recommended except as a regular practice. It should then be an effective preventive of scale. But as an occasional remedy for scale it is too costly and laborious.

ETHICS OR EXPEDIENCY?

A correspondent of ours, who is himself prominent as a mining engineer, was recently confronted with a problem in professional ethics. Some time ago he had made a report for a mining company. That company fell upon evil days and its directors were prosecuted. Those interested in the prosecution approached our correspondent and requested him to report again upon the mine.

At first flush, it seemed to the engineer that he could not honourably accept to this request. Would it not place him in a questionable position were he to lend his services to the antagonists of men who had been his clients? Did he not, at least, owe it to his former clients to assume a negative attitude?

Further thought, and a little discussion, cleared his mind and altered his point of view. His work for his former clients had consisted in observing and recording matters of fact, and in giving his professional advice on the conditions he had observed. His report had been completed and paid for. It became the property of the company. The company was not bound to act upon his report, neither was he in any sense responsible for the company's further action. Should his report be subjected to gross misuse, he had the privilege of making a public protest. Otherwise his connection with his clients ceased, and the incident was closed.

And, therefore, no consideration of duty or fair play entered into the question to deter him from again examining the mine for other clients. Clearly it was his duty to make a new and thorough examination, and not merely to revise his former report. Also, it was his duty to withhold from the new clients all information embodied in the first report, until, at least, the second report should have been made. Similarly, it would be incumbent upon him to regard his second report as confidential, and to preserve it from all persons except those who engaged him—the authentic owners of that particular document.

In other words, the consulting mining engineer is an impersonal advisor. He must be disinterested, both financially and sentimentally. But, apart from questions of personal expediency, there is absolutely nothing in the unwritten professional code to prevent the acceptance of this kind of an engagement.

EDITORIAL NOTES.

Mr. D. Lorne McGibbon has categorically denied the rumour that the La Rose surplus has been invested. It is still wrapped safely in a napkin.

At the low grade nickel deposits at Webster, North Carolina, where nickel silicate has been mined for some time, the Hennig process of reduction to nickel silicide has been abandoned. Experiments are being conducted with the Reid electric furnace. The latter device proved a fiasco in Cobalt. It has nothing to recommend it.

The mineral production of Alaska is rapidly growing in importance. The shipments of copper alone during the first half of the present year represented 18.590.-158 pounds, and what is more remarkable this considerable output was for the major part from one mine, the Bonanza, owned by the Guggenheim-Morgan syndicate.

Our gracious Sovereign served a short apprenticeship the other day in an English coal mine. Accompanied by sundry dignitaries he used a pick for a few minutes and succeeded in breaking down some coal. His good example should be followed. We would like to see a few of our glad-hand politicians "muck" for a shift or two in a wet mine.

Mr. Eugene Coste is to be congratulated on the completion of the undertaking of which he has had direction —the laying of the pipe line to convey natural gas from Bow Island to Calgary, a distance of 181 miles. The contract for this work represents, it is said, the largest single order ever given for piping and has entailed an expenditure of approximately three million dollars. Incidentally it means a great deal to Calgary, whose industries will be stimulated by this provision of cheap power.

The coal mining department of the Delaware, Lackawanna and Western Railway has found a new use for photography in educating the foreigner unable to speak or understanding English in things he should not do if he would avoid injury. Thus the company has issued a volume of some two hundred pages illustrated with photographs depicting on opposite pages the right and wrong method of procedure in mining, the wrong being indicated by the word "don't" printed in red. The idea is an admirable one

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Hereafter the common or garden fowl should be recognized as a necessary addition to every prospector's equipment. We are informed that as a result of the discovery of gold in the crops of a number of chickens several rich claims were recently staked near Winnipeg. There can be no doubt that with a little direction where to scratch fowls could be made to play a very useful part in aiding the prospector. They could also be eaten if they didn't do their duty or when other

grub was at a discount. The eggs, too, would come in handy.

According to the telegraphic reports, excellent results are being obtained this year from dredging operations in the Yukon. Thus the Yukon Gold Company's returns for June show that 856,600 cubic yards were dredged during that month, as compared with 667,339 cubic yards in June, 1911; the average recovery being 73 cents per yard as against 57 cents; while the value of the bullion produced was $626,400, or nearly as much as over half last season's yield. During the present season to date gold to the value of $1,116,700 has been recovered.

The aggregate amounts distributed by the Dominion Government in the form of bounties on minerals and mineral products during the year ending March 31st last, was $538,529, as compared with an outlay on this account in 1910-1911 of $1,591,663. The sum was made up as follows: Wire rods, $160,750; crude petroleum, $141,935; lead, $179,288; manila fibre, used in the manufacture of binder twine, $50,556. Since 1896, when the bounty system was introduced, the total payments have been rather over $21,000,000, of which seventeen million dollars have been paid in bounties for iron and steel manufacture.

It is surely an anomalous state of affairs that, though the greater proportion of the nickel produced in the world is derived from Canadian mines, there is no Canadian nickel currency. France, by-the-way, is now proposing to substitute nickel for copper in the smaller denominations, as well as for 25 centime pieces, which, of course, have been in circulation for some time past. If for no other reason than that of sentiment, the Dominion should follow suit. In fact, it would be a fitting tribute to Canadian metallurgical achievement to provide for the coinage of "Monel" metal. This alloy should, moreover, be eminently suitable for coinage purposes.

The discovery of a large body of nickeliferous ore is reported to have been made near Kremmling, Grand County, Colorado. The nickel occurs as millerite, in it is said a vein of eighteen feet wide that has been followed by a 60-foot drift at a depth of sixty feet. The ore has been assayed in Denver, Leadville and New York, the samples yielding from 10 to 20 per cent. nickel. It is remarked that the owners are confronted with the problem of finding a market for nickel in the West; but if it averages over ten per cent. this difficulty is one that should not be the occasion of overwhelming anxiety. A 15-foot of millerite seems almost too good to be true.

We are informed that recent developments have resulted in greatly extending the productive area of the platinum placers of the Tulameen River, in the Similkameen District, B.C. A small production of the metal has been maintained from this field for some years past, but not to a sufficient extent to become a factor in the world's production, which at present amounts to about 6.3 tons, of which the bulk, namely 6 tons, is produced in the Urals, and the balance mainly by Colombia. In a minor degree, Abyssinia and Borneo contribute to the annual yield, and there are also unimportant deposits in Brazil; but notwithstanding the search of recent years no new sources of platinum have been discovered and meanwhile the reserves are gradually being depleted.

Dredging for tin was begun in Alaska last year, on Buck Creek, on which are the best tin placers now known in the country. This stream is about four miles long and the gravel is probably nowhere over 9 feet deep, while very few of the pebbles are over 4 to 5 inches in diameter. In the creek bed the content of stream tin, carrying in the neighbourhood of 65 per cent. metallic tin, has been found to be as high as 400 pounds per cubic yard in rich spots, though the average is much lower. The dredge, which was built specially for shallow digging, has buckets holding 2½ cubic feet., and is driven by gasoline engines. It is equipped with two sluice boxes to provide for continuous operation, and digs from 950 to 1,000 cubic yards each 24 hours. Operations were stated on September 10th of last year and continued until the season closed on October 15th The ground dug is said to have been yield represented between 6 and 7 pounds of stream tin per cubic yard. The total output was 92 tons of stream tin averaging 66 per cent. tin, or an equivalent of 101 tons carrying 60 per cent. tin, and sold for $52,000.

The reports for last year of two of the great Alaskan mines are now available, and as usual contain much information of technical interest especially in the matter of operating costs. These, in the case of the Alaskan Mexican, represent a total, including mining development, milling administration and construction and repair costs, of $1.7725 per ton of ore milled, leaving a net profit of $1.0909. Of the individual items, the chief expense naturally is that of mining development and stoping, representing $1.2036 per ton; while the milling costs (carried also to four places of decimals) were .2697 cents per ton —a truly remarkable record, notwithstanding the peculiarly favourable conditions obtaining. About half the values in the Treadwell ores is recoverable by amalgamation, and until recently the concentrates were smelted at Tacoma. Last year, however, a plant, jointly owned by the three companies, was erected on Douglas Island, for local treatment, by cyanidation, of this product. The operating costs at this plant, for the period from May to December, 1911, are tabulated in detail, the total cost per ton being $2.8115.

A new course has been added to the curriculum at the University of Birmingham, England, the object of which is to create specialists in petroleum engineering. It is an excellent move, and if one of our Canadian universities would follow suit, such a course would undoubtedly be both useful and popular, particularly if the university in question were enterprising enough to secure the services of Mr. Eugene Coste as lecturer. There is, meanwhile, no reason to doubt that in due time new Canadian oil fields will be discovered and developed; but even at present there are openings and opportunities in the Dominion for men specially trained in this branch of mining. For some years the University of Birmingham has provided special courses in petroleum mining, and many of those who have taken advantage of the facilities thus afforded are now holding responsible positions in the industry. It is now designed, however, to grant a degree of B. Sc. (Petroleum), candidates for which are required to matriculate in the faculty of science before entering the special course of study, the features of which include boring (in all its branches) surveying and borehole surveying, petroleum mining geology, petroleum mining law, and the transport, storage, and refining of petroleum, in connection with which the students will attend lectures and laboratory classes in the sciences allied to the subject.

Many expressions of regret have reached us at the discontinuance of the series of annual reports as formerly issued by the Geological Survey of Canada. The present practice is to issue a summary report and in addition thereto a number of separate "memoirs," or individual reports as occasion demands. There are several reasons for the abandonment of the old method of publishing, none of which, however, would appear to be entirely adequate. It is claimed, for example, that there may be an exceptional demand for one memoir in particular and that if it were included in the annual report the issue would be speedily exhausted; and that, moreover, to present a man with a big volume when he merely requires one of the reports incorporated in it, is an extravagant procedure. In this we agree; but surely the obvious way of meeting the difficulty and objection at the same time is to publish a certain number of the reports in separate form, reserving the balance for inclusion in a volume at the close of the year. There are many mining engineers, and geologists in Canada who are anxious to preserve the sets of the Survey's publications intact. To public and institution libraries this is even more important. The publication of an annual volume provides for this requirement better than is possible by any other means. We would, therefore, urge that the matter be given further consideration by the Director.

CORRESPONDENCE

Editor Canadian Mining Journal:

Sir,—"E. J." in your issue of August 1, avails of a palpable slip, to intimate that Mother Lode, Sheep Creek, recovery per ton is in doubt. My calculation that a monthly profit of $25,000 would probably be earned, was based upon the assay plans of Mr. Watson and the milling returns on several shipments to smelters. A net recovery—and the "net" was inadvertently omitted from what appeared in The Mining Journal of London—of $14 per ton, is what is expected. This allows for working costs of $7 per ton. So that, whatever the contrary view may be, it is beyond question that the Mother Lode ore developed is expected to yield a per ton profit of $14. With low power costs and a very high extraction, there is no reason to doubt a profit of 66 per cent. on the gold contents being recovered.

Very truly yours,

ALEX. GRAY.

A bill has been introduced to the United States Senate providing for the acquisition and title to coal lands in Alaska. Legislative sentiment in the United States is now strongly disposed towards the leasehold rather than freehold, system of tenure with respect at any rate, to the fuel minerals, such as coal, oil, and natural gas, and despite the pressure brought to bear by influential interests, it is certain that the principle on which the present Alaskan coal bill is based will be upheld. The committee in charge of the measure have, however, recommended certain modifications in detail, which would appear to be advantageous. These include an increase in the term of the lease from thirty to fifty years and provide also for the renewal of the lease at its termination. It is further recommended that the royalties proposed be reduced to a minimum of 2 per cent., and a maximum of 5 per cent. upon the value of the coal at the mine.

In a paper contributed to the American Institute of Chemical Engineers, Mr. L. S. Hughes discusses the use of pulverized coal for furnace fuel. In Europe the accumulated colliery waste of years is now being utilized with success. As Mr. Hughes points out the chief difficulty has been the destruction of the fire-box and crown sheet. Both bricks and steel "melted" little by little, which effect has been attributed to the high temperature of the flame produced by pulverized coal. When the temperature of the flame was reduced the grate-bars, crown-sheet, and walls of the fire-box became covered with a vitreous, adherent coating of slag or clinker. This clinker is similar to the slag produced in blast furnaces, and is evidently formed by the action of the silican of the ash with iron oxide. The silica would also act on the firebrick by reducing its melting point. The remedy tried and suggested consisted in introducing powdered limestone with the coal dust. A simple air-blast injector fed the coal into the fire-box, and a small quantity of limestone, roughly equal in weight to the ash of the coal, was introduced with it. Immediately the character of the ash formed changed from a sticky shower to a dry, powdery material which displayed no tendency to cohere or clinker in any way. It is stated that pulverized coal is now being used in the furnaces of the Canadian Copper Company, at Copper Cliff.

COAL STRIPPING IN ALBERTA

By D. B. Dowling.

It may be said with a good deal of truth that all kinds of coal are to be found in Western Canada and likewise examples of all kinds of mining. The outcrop of coal gives long and wide areas in which the cover over a

Castor, Alberta—Uncovering 7 foot Seam by Team and Scraper

Tofield, Alberta—Bench Made by Steam Shovel. Bottom is on Coal. A Blast is going off

seam is shallow. In this district the cover is generally of a soft nature, and so renders underground mining seams in the flat lying measures of Eastern Alberta difficult.

Several enterprises have been originated with the object of mining the coal by removing this cover, and the accompanying photographs of the principal one will, it is hoped, prove interesting as a new departure in coal mining. From the large area to which this class of mining may be applied, it is readily seen that the success of the venture is important. From Tofield, where one of the Edmonton seams outcrops, southward for 130

Tofield, Alberta—Steam Shovels in Operation. Lower Shovel on Coal

Tofield, Alberta—Loading Coal from a 9 foot Seam

miles, what is practically the continuation of one seam of coal has been discovered at intervals by settlers, partly in digging wells and at other places exposed in shallow valleys. The results demonstrate that for this distance and for possibly a width of over half a mile, coal with a thickness varying from a maximum of eleven feet to a minimum of about four feet, can be obtained by stripping the surface cover. The photographs of the Tofield locality show the operation of steam shovels removing about 19 feet loose sandstone and shale and the loading of coal from a 9-foot seam. Another photograph is of stripping by team and scraper at Castor, Alberta, and the exposure of about seven feet of coal.

THE ACTION OF ALUMINA IN SLAGS.

In his presidential address before the Australasian Institute of Mining Engineers, Mr. H. C. C. Bellinger made an interesting reference to the diversity of opinion among metallurgists regarding the action of alumina in the formation of copper slags, and accounted therefor on the grounds of the erratic behaviour of this element. Speaking from his own experience in treating the copper ores of Rossland and Crofton, B. C., he first quoted the following description of the Rossland deposit by Kemp. "The ore bodies exist at or near the contact of gabbro and porphyry, the extent of the mineralized zone being about four miles long by one mile wide. The contact is not abrupt, but the gabbro passes gradually into augite, porphyrites and diabases, seldom more than one mile wide, and brecciated." The gangue matter of these ores analyzed approximately:

From 14 per cent. to 18 per cent. alumina.
From 10 per cent. to 12 per cent. lime.
From 2 per cent. to 3 per cent. potash and soda.
From 40 per cent. to 46 per cent. silica.

Mr. Bellinger stated that the first metallurgist who attempted to smelt these ores arrived at the conclusion that the alumina should be calculated as an acid and found, on this assumption, that a certain percentage of limestone was required. The furnace was blown in, but the campaign abruptly terminated at the end of two hours by the freezing up of the furnace. The metallurgist concluded that the alumina was more active than he had first considered, and therefore increased the percentage of limestone, with the same disastrous results. The company then decided to call in another metallurgist, who took an entirely different view of the alumina. He assumed that that part of the alumina which was in combination with silica would continue to perform the function of a base, while the balance would probably assume the opposite role, which happened in this case to be equivalent to eliminating the alumina entirely from the calculation. A charge was made up on this assumption, and no difficulty whatever was experienced, the result being in every way highly satisfactory. No practical alteration was made in the composition of the charge for some years, the regularity of the ore making this unnecessary.

While in this particular instance the alumina appears to have played no prominent part in the formation of the slag, at one of the metallurgical plants at Butte, Montana, where the economic conditions demanded the formation of a slag ranging from 45 per cent. to 50 per cent. of SiO_2, the alumina definitely assumed the role of a base, as the following analysis will testify:

SiO_2, 45.4; FeO, 24.0; CaO, 18.5; Al^2O^3, 7.9.

Thus, he remarked, we have here 24.2 Oxygen united contained in the acid, while the base units gave 10.62 units of Oxygen, the result being a true bi-silicate slag. If the alumina be included on the acid side, we have the ratio of 2.6 to 1.

A similar instance is shown in the North-Port slags of the following composition:

Cr_1, 43.5; SiO_2, 43.5; Fe_1, 20.0; CaO, 16.0; MgO, 4.5; Al_2O_3, 14.5.

Here we have 23.3 units of oxygen in the silica, and 10.81 base units in the FeO, CaO, and MgO, while 6.75 units are included in the alumina. If the latter be taken as acid we have an oxygen ratio of 2.8 to 1.

The following slag represents a two weeks' run on the Britannia plan, Vancouver Island:

SiO_2, 50.4; FeO, 20.5; CaO, 22.22; Al_2O_3, 6.5. Here we have 26.88 acid units of oxygen in the slag, and only 10.7 in the base. Including the alumina as a base, the oxygen ratio approximates the bi-silicate; while including it as an acid, the ratio would be 3 to 1, which is beyond reason.

At Crofton, Mr. Bellinger was engaged in the smelting of a baryta ore, containing on the average from 40 to 45 per cent. barium sulphate. The ores also carried from 8 to 9 per cent. zinc. On account of the low formation point of the slag resulting from this ore, it was necessary to add both silica and alumina before the furnaces could be made to run satisfactorily. The slags ranged from 5 per cent. to 12.2 per cent. alumina, and the action of alumina here was most confusing. The aim at this, as well as at other plants, was to utilize, so far as possible, the base units, and the object, therefore, was to crowd as much silica on to the charge as possible. All of the slags resulting from the various mixtures made were commercial, and ran in a highly satisfactory manner; still, I found that in some cases the alumina apparently acted as an acid, while in the other cases similar assumption would clearly have resulted in an impossible slag, since the result would have been a ratio of 2.7 of acid to 1 of base. Neglecting the alumina we have a ration of 1.91 to 1, closely approximating a bi-silicate type.

At Cobar, where Mr. Bellinger is at present engaged as general manager of the big copper mines there, other conditions obtain, as shown by the following analyses:

Cu.	FeO.	SiO_2.	Al_2O_3.	CaO.
		Neutral Alumina.		
.2	49.2	41.4	5.8	1.0
		Acid Alumina.		
.3	51.4	39.2	6.5	.6

Thus in the instances enumerated, the action of alumina is in each case different, at once acid, base and neutral. And Mr. Bellinger points out that obviously it is impossible to deduce from such data the exact function of alumina. To quote his concluding remarks: "Personally, you will note, I have operated plants where the slags seem to have placed beyond all doubt the definite action of alumina in one or other of the various allocated roles. But from diversified experience it is plain to me that we must look beyond the mere chemical analysis of the ores in order to evolve a reasonable and definite process of action for alumina. Take, for instance, the porphyritic formations with the large influence of the felspars in evidence, and we have certain combinations for silicates of alumina and other bases. The felspars constitute an extensive list of minerals with a wide range of composition, from othoclase with 18.4 per cent. of alumina and 16.9 per cent. of potash, to anorthite with 36.7 of alumina and 20.1 CaO. Both these felspars, physically and chemically, in their respective behaviours under similar treatment, are widely divergent. Thus, on through the various meta-silicates, orthosilicates, to the hydro-silicates, we find the same varied conditions physically and chemically with widely different genetic laws. The range of oxygen ratios varies from less than one to one in the sub-silicates, to four to one in the disilicates. It is when one considers the many conditions of combination in aluminous compounds, and has noted the definite changes in the action of the alumina in sympathy with variations in such combinations that it becomes quite feasible that, under similar furnace conditions, we could reasonably expect the compounds to adopt roles suited to their peculiar forms. Many engineers have for instance, found, under

certain conditions, that by calculating the alumina solublem acids on the acid side and treating the insoluble alumina either as base or as an independent elementary magma they have obtained excellent results. Though Peters says that this method has no scientific foundation, it is interesting to note that it has been a success in some cases, and the reason for this success may in future be condensed to a scientific basis.

"At Cobar we are carrying out a series of experiments. While the outcome of these many not alter the present status of alumina, we trust that the information secured will be of some value."

PHYSIOLOGICAL EFFECTS OF CARBON MONOXIDE

*By Prof. Henry S. Munroe.

An interesting pamphlet on carbon monoxide has recently been issued by the Bureau of Mines, in which attention is drawn to the dangerous properties of this gas and to the use of mice and birds for detecting its presence in mine air. The author quotes largely from various publications of Dr. J. S. Haldane of Oxford University, who for many years has made special study of the subject of mining hygiene and the dangerous gases met in mines. The author states (p. 6) "According to Haldane, carbon monoxide has no other effect than that resulting from its interference with the oxygen supplied to the tissues, and apart from its property of combining with the hæmoglobin it is physiologically indifferent, like nitrogen." The author also outlines an experiment in which he remained for twenty minutes in an atmosphere containing 0.25 per cent. of carbon monoxide, "at the end of which time he suffered only a slight headache, although later he became ill. The illness lasted for several hours and was accompanied by nausea and headache." The quotation from Haldane and this experiment, are likely to give a false impression as to the dangerous properties of this gas; it has therefore seemed wise to give a few facts that others may not be led to repeat the experiment made by the author of the pamphlet, and to give some idea of the dangerous nature of this gas even when present in very small amount.

Carbon monoxide is a product of incomplete combustion. It is present in large qnantities in producer gas and water gas, and in dangerous amounts in the gases from boilers and furnaces of all kinds. It is often present in large proportions, and always in dangerous amounts, in powder smoke, in the gases from underground as well as surface fires, and in the afterdamp from explosions of firedamp and coal dust.

Carbon monoxide has the property of forming a compound with the hæmoglobin of the blood. The effect of this is to make the hæmoglobin, so combined, practically inert and to prevent it from acting as a carrier of oxygen. When so much carbon monoxide is absorbed that the greater part of the hæmoglobin is inert, death results. The affinity of carbon monoxide for hæmoglobin is more than 200 times greater than that of oxygen, so that when present in the air, even in small quantities, it is freely absorbed by the blood. Carbon monoxide is not displaced by oxygen but is dissociated by natural processes, and escapes in the expired air. Where large quantities are absorbed, it may be several days before the last traces disappear. According to Doctors Edsall, von Jaksch, Haldane and other authorities, 0.05 per cent. of carbon monoxide is dangerous. According to Haldane, severe symptoms were observed from breathing air containing 0.02 per cent., or one part in 5000. With this small amount present the blood becomes 20 per cent. saturated after about 20 hours, producing slight giddiness and shortness of breath. At this point an equilibrium seems to be established, and the dissociation of the gas keeps pace with its absorption. With increasing percentages of carbon monoxide, the saturation of the blood becomes greater and the time required to produce the maximum effect shorter. With 0.08 per cent. present, the blood becomes 50 per cent. saturated within a few hours; it becomes scarcely possible to stand and even slight exertion results in loss of consciousness, the senses are confused and the judgment is impaired. Sometimes the victim either becomes stupid and drowsy, or much excitement results, not unlike the effects of alcohol. Another experiment by Doctor Haldane proved that with 0.20 per cent. CO in the air the blood becomes 50 per cent. saturated in 70 min. With 0.25 per cent., the amount present in the Bureau of Mines, experiment, this dangerous condition would be reached in less than one hour.

According to von Jaksch, the absorption of 0.8 gram of carbon monoxide is fatal. According to Haldane, if death occurs gradually the hæmoglobin is usually about 80 per cent. saturated with carbon monoxide. Post-mortem examinations of persons who have died from carbon monoxide poisoning show that the effect is to produce intense congestion of the vital organs, especially in the brain, usually accompanied by small hemorrhages. It is possible that this congestion is due to the attempt of nature to make good the diminished efficiency of the blood by supplying larger volumes at needed points.

Even when death does not occur, serious results are likely to follow from the absorption of this gas by the blood. The after effects are lesions, cysts and local softening of the brain tissue, inflammation of the membranes of the stomach and intestines, pneumonia, bronchitis, pleural effusions, inflammation of the kidneys, fatty changes in the heart, ænemia, splenic enlargement and other derangements of vital organs, sometimes resulting in death even after several years. It is believed that Sir Clement LeNeve Foster was a victim to carbon monoxide poisoning which occurred on a visit as chief inspector of mines to a mine in Cornwall a few years before his death. From the full record given by Mr. Foster of his symptoms while exposed to the gas underground it does not appear that there could have been more than 0.08 per cent. of carbon monoxide present, nor that his blood could have been more than 50 per cent. saturated, although direct evidence on both these points is lacking. The experiment made by the author of the paper recently issued by the Bureau of Mines, in which he exposed himself for 20 minutes to an atmosphere containing five times as much carbon monoxide as is known to be dangerous was therefore hazardous and even though the experimenter apparently suffered but little ill effect a some-

*Article by Prof. Henry S. Munroe, "Physiological Effects of Carbon Monoxide," in the School of Mines [illegible]

what longer exposure would certainly have resulted in serious injuries, the after effects of which might have proved fatal.

One of the most serious dangers from the presence of carbon monoxide in the air of mines is the effect upon the health of workmen who are daily exposed to the breathing of small amounts of this gas. The blood, when partly saturated, is thereby rendered less able to perform its proper functions, so that the patient suffers from ænemia and all the complications that may result from this weakened condition. According to Doctor Edsall, the disease known as miners' phthisis has been shown to be due chiefly to carbon monoxide poisoning. Recent observations have shown that for some hours after a blast, under the conditions of ordinary mining, carbon monoxide may be present in the air in dangerous amounts, and undoubtedly the blood of men engaged in sinking, drifting, and stoping where the circulation of air is deficient is partially saturated with carbon monoxide the greater part of the time.

By some authorities it is believed that the serious effects above outlined, due to absorption of carbon monoxide by the blood, are supplemented by direct toxic action on the nervous system, on the muscles, the heart and other organs. It is believed by others that there is a cumulative action and that those who have been poisoned by this gas are more likely to become victims when again exposed to it. It is quite certain that dissociation of carbon monoxide from the blood is slow and that those whose blood is partly saturated will sooner fall victims where larger quantities of the gas are breathed than those whose blood is free from this gas. Men who have repeatedly suffered from carbon monoxide poisoning becomes very sensitive to the gas, and in most instances are compelled to abandon work in which they are compelled to breathe air containing it.

The symptoms by which carbon monoxide poisoning may be detected are not difficult of recognition. The blood becomes a brilliant cherry red, and in serious cases red or bluish-red spots appear on the front of the neck, on the trunk, thighs and elsewhere, lasting for some days, and in fatal cases apparent after death. The mental disturbances, weakness and lassitude, have been noted. This is followed by headache, accompanied by nausea, often lasting 24 or 48 hours, even in slight cases, In more serious cases, headache may recur at intervals for some months. Loss of consciousness with convulsions, may occur several hours after the poisoning. One of the first symptoms is weakness in the knees and legs, sometimes lasting for days, with aching from the knees to the ankles. Local pains in the region of the heart, and palpitation of the heart, are common and may recur at intervals for a month or more. Foster, and several others, have published valuable notes on these symptoms, which wil be found in the appendix of Foster and Haldane's "The Investigation of Mine Air."

EARLY MINING OF COAL IN GLACE BAY DISTRICT, C.B.

(Paper read June 12th, 1912, by J. C. Mitchell, South Cape Breton Mining Society.)

As requested by the members of this Society, I will, in as brief as space as possible, and altogether from memory, give a description of the methods and appliances used in the early mining of coal in the Glace Bay district.

The history of the mining of coal on the Island of Cape Breton, including the Glace Bay district, from the year 1498 when the Island was discovered by Sebastian Cabot up to the year 1857, is given in the "Coal Fields of Cape Breton" by the late Richard Brown, Esq., F.G.S.

The first mining of coal that could be called mining, was started by my venerable father in the year 1857 in what was then called the Roost Seam, in the cliff on the west side of what is known as the Burnt Mine, or Red Head; and I believe that there are some members here to-night, including our worthy president, who can call to mind this particular locality from events that transpired there in recent years.

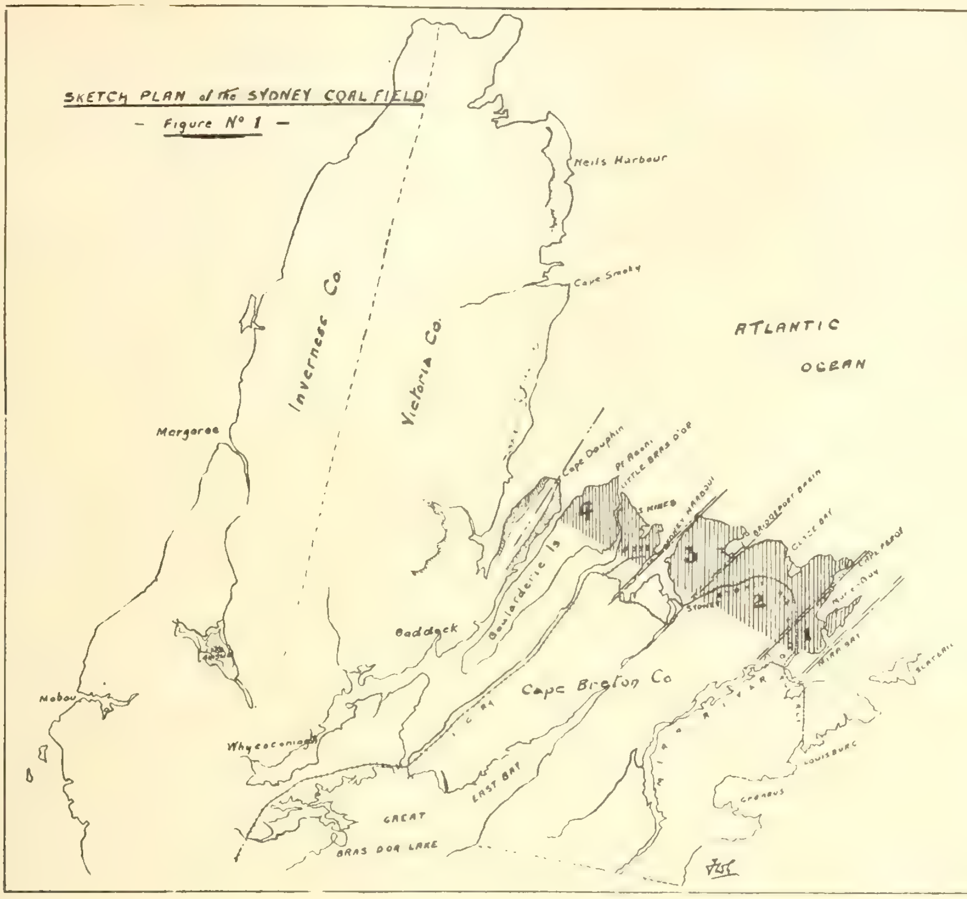
An opening was made in the seam above high-water mark and a small wharf built on the shore from which scows were loaded with coal by means of wheel-barrows. These scows were rowed off to vessels anchored in bold water and the coal shoveled on board and shipped to the Halifax market. Another opening was made in the same seam on the east side of Burnt Head. A drift was driven in through the burnt stone and coal for quite a distance before the solid coal was reached. This work had to be done very carefully as the cover was very bad. The coal from this opening was shipped in the same manner as that employed at the first opening; but, on account of it being impossible to build a wharf that would withstand the violence of the storms, and as the coal from the Roost Seam was well liked by the consumers, another and more favourable place was started at what was then known as the Shag-Roost—the place getting this name from the fact that great flocks of large birds called shags were accustomed to roost there overnight. After a few years the word "shag" was discarded and all of that district was known as the Roost. Hence, the Roost Pit; Roost Wharf; Roost Row; etc. A slope was driven down on the crop of the coal, and a small but substantial wharf built at the Roost Head, at which vessels drawing thirteen feet of water could be loaded. The first coal was taken down to the vessels with horses and carts, but later on an inclined plane was built. A large wooden drum was put up at the top of the plane. It was set up in a strong frame about seven feet above the tracks, and the horses hauling the coal tubs out of the slope would pass under the arm to the top of the plane leaving the full tubs and taking back the empties. The track on this plane was laid with hardwood plank 10 inches wide x 2 inches thick; and a 2-inch square of hardwood fastened on the inside edge with trunels. This strip kept the tub on the track. A manilla rope was used on the inclined plane. The system of mining was room and pillar; the coal was mined on a "bench" sheared on both ribs, and taken down with maul and wedge. Very little powder was used as the "bench" was also sheared on both ribs and taken up with wedges. In the shipping season, the coal was riddled in the mine and the slack stored back in the room; but in the winter the coal was banked as run of mine and riddled in the bank before being shipped. The coal was hauled right up on the bank by horses; some times

a tandem team being used. The tubs were built to carry a half-ton and I feel quite sure that they did. The tub was made with iron frames the same as some of the present day tubs, but rivets were used to fasten the lumber to the frames instead of bolts. The wheels of this tub were made of wood, just the same as the present day cast wheel but, of course, only 16 inches in diameter. The tire was 2 x 3/8 inches and shrunk on the wheel, and the bushing that was in the hub of the wheel was the same as tat used in the old Dutch ox-cart and Pharoah's chariot. The track in the slope was the same as the track on the incline; viz., hardwood plank; but in the rooms, the tub was hauled on the pavement and used to run very well. The rooms were driven 16 feet wide and as the cover was light the pillars were small.

Glace Bay Harbour 25 Years ago. Shows the Old Caledonia Pier, and the Pelr of the Glace Bay Mining Company, Seaword.

The mine was ventilated by natural ventilation, a small shaft being used for an upcast. All the water that this mine made was hauled out by horses and water tubs, but, later on, a level was driven from the shore at a point just above high water which drained quite a strip of the crop coal. Very few buildings were required at the mine. The Mines' Office was in one end of a large building called a "shanty" which was made of round logs and had a large chimney and fireplace in one end. A blacksmith shop was built in the same way. A very good barn was also built. This was a frame building with stable room for seventeen horses, as the pit horses were stabled on the surface at that time. All the settlers of the place used to work at this mine in the summer, and any extra men required used to get board at the farmhouses. About this time Glace Bay got its first "boom." A strong company, for these days, was formed of Halifax and Boston gentelmen, with the late James A. Moren, of Halifax, who was also president of the Union Bank of Halifax, as president, and the late E. P. Archibald as secretary. Other Halifax gentlemen were also in the company. The principal Boston men were Captain Barret, Mr. Conves, Dr. Howe and Mr. Emery. Enough capital was subscribed to sink what is known as the Stone Slope, build a bankhead and screens, and to purchase an engine to haul the coal up the slope. A short description of this engine will be given later on. A small house for the manager, as well as colliery buildings and a number of dwellings for the workmen, were built. The present Glace Bay harbour was opened up, the railway built to the mine, and warehouse, office, carpenter and blacksmith shops, large barns and other buildings required, including a "Pluckme," were erected. The first coal that ws shipped from the new harbour was hauled from the Roost with horses and carts. The price paid for a load of a half-ton was twelve and one-half cents, or two loads for a quarter. After the railway was finished the coal was shipped in cars, but horses were employed to haul them to and from the mine and harbour.

The first cars that were used were known as the hopper car. They carried two chaldron or three tons. The wheels of these cars ran on the outside of the car and had what is known as inside bearings, just the same as the ordinary pit tubs, but, of course, larger The axles could be greased with a brush from underneath. I think it was two of these cars that were in



use, but the second lot of cars were a much better kind and carried four tons. This car had outside bearings with an axle box in which wool and oil were used, and I often heard the railway drivers say that the horses could haul the four-ton cars with less labour than the three-ton, due to the different style of bearings. This way of hauling the coal was continued for two years, then a small locomotive was purchased in Glasgow, Scotland, from the firm of Nelson. This engine pump was running light to supply air instead of water. The engine was supplied with the old-fashioned hand-brake, on which was used wooden blocks instead of iron. As the engine did not have any cab the men were exposed to all kinds of weather. We did not have any cylinder oil in those days, but tallow was used as a lubricant. As a rule, the tallow was always kept ready for use in a kettle placed on the steam chest cover, and when the engine wanted tallow, the fireman,

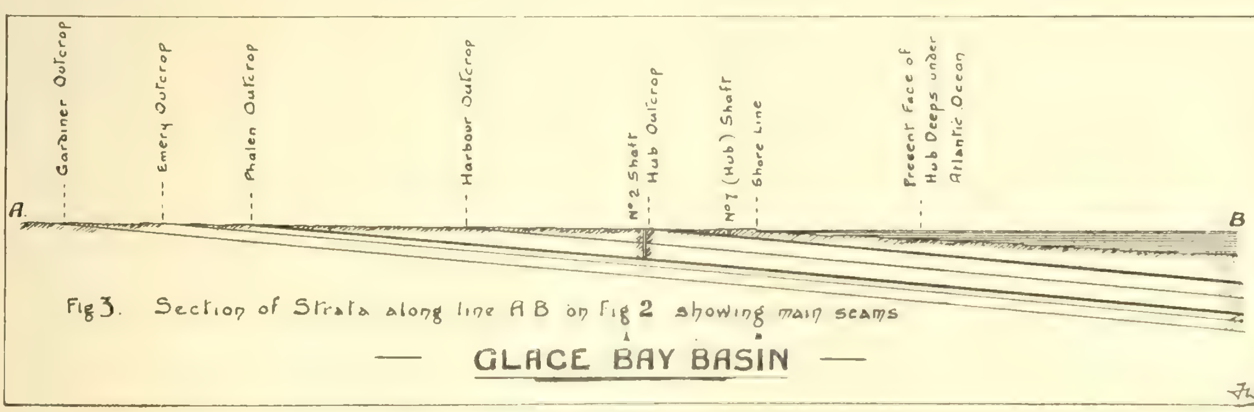


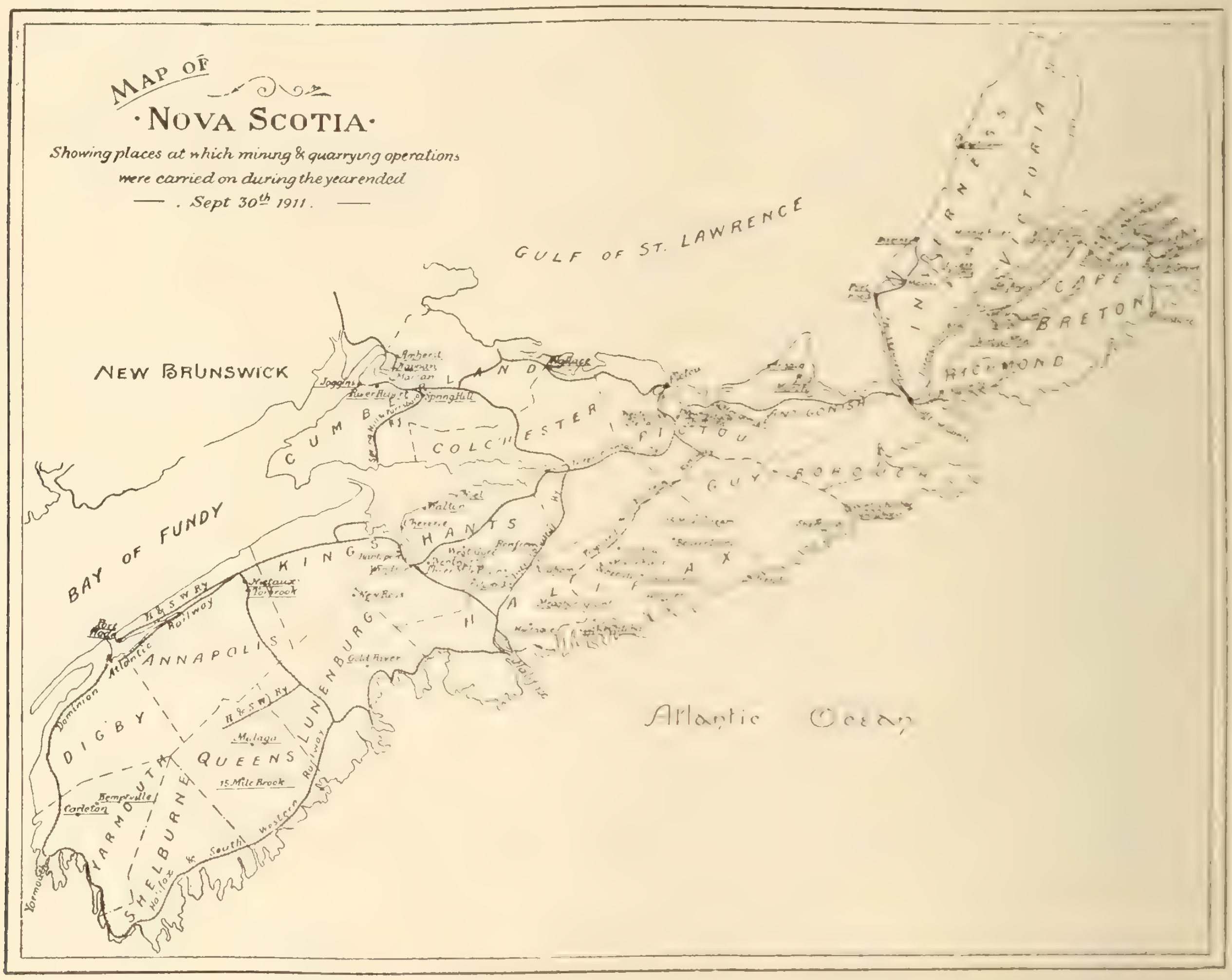
Fig 3. Section of Strata along line A B on Fig 2 showing main seams

— GLACE BAY BASIN —

weighed thirteen tons. The boiler was fed with pumps, one on each side, attched to the crosshead. The water, which ran to the pump by gravity, was carried on top of the boiler in a small tank. In this tank, at the outlet was place da valve which was opened when the boiler required water. In the working-barrel of the pump was placed a small pet cock, controlled by a lever in the hands of the driver, which was opened when the who in this case was fireman, brakesman and conductor, all in one, would jump off the engine at the top of a grade and run to the front end and give the cylinders a drink while the engine was running down grade with the steam shut off. The sand that was required for use on the rails was carried in a long narrow box which hung on the engine just over the drawbar, and from this box the fireman would spread it on the rails by

hand. If the boiler wanted water the fireman would uncouple from the train and run along the road to feed the boiler. The largest load which I remember seeing this engine carry was fourteen cars; ten of coal and four of coke. Nevertheless, she did good work and was a great improvement over the horses. It was found before the road was completed that there was not enough rails to put in sidings, so 6 x 6 scantling was put down, well spliced, and faced on the top with 2½ inch x ½ inch iron. This worked very well.

While sinking the Stone Slope a "gin" was used and, in fact, some coal was hauled by the same means until the little haulage engine was installed. This engine was a double or two single engines attached to an upright boiler and when the engine was hauling up one trip the empty trip was let down with the brake, the drum being thrown out of gear. This boiler was also fed with a small force pump which was connected to the crosshead of the engine with what was called a "gape lever" and if the boiler required water and the trip was not ready, the arm was thrown out and the engine run so as to feed the boiler. When the boiler tubes required cleaning, which was about once each shift, the fireman had to get up on the roof of the engine-house and take off the smoke stack to get at the tubes to brush them out. But with all its shortcomings, it was a great improvement on the "gin." When the mine was opened out so that a fair output could be produced an up-to-date engine was purchased. This engine is now driving the bank machinery at No. 4 colliery. This engine, which was of the single type, with a cylinder 12 inches x 36 inches, worked splendidly and was extra well finished. As this engine only ran one way, the reversing of the drum was done with two pinions running loose on the main shaft which matched a large level spur wheel that was on the end of the arm shaft. The pinions were set in motion by a double end clutch and by changing the clutch from one to the other of the pinions, the haulage drum was reversed, and by placing the clutch in the centre the drum would be stationary and the engine could be used for pumping. Some time after the engine was installed, a shaft was sunk a little to the west of the bore holes, through which the pumping was done, and a pair of 8-inch by 4-inch pumps were installed. They were, of course, the old style force pumps. These pumps were placed at the bottom of the shaft and worked from the surface by the haulage engine already described, with what is called dry rods—two well made wooden V-bobs that were placed, one on each side of the shaft on good stone foundations and connected together with a wooden connecting rod at the top, and wooden rods or spears connected the plungers of the pumps at the bottom of the shaft with the V-bobs at the surface. The V-bobs were connected to the engine, which was about four hundred feet away, with wooden spears which were made of 6-inch x 6-inch black spruce, nicely dressed and fastened together with 4-inch x ¾-inch iron, with ten ⅝-inch bolts to each joint. The spears ran on cast iron rollers with a frame



on each end which kept them in line. These rollers were set on hook bearings which were well fastened to upright posts, the posts being set into sills which were put down in the ground about three feet. The under side of the spear was shod with flat iron to prevent the spear from cutting. A forked connecting rod with a centre guide was used at each end of the spear to allow for the revolution of the crank and the rise and fall of the V-bobs. The spears were driven by a male pinion on the end of the main shaft of the engine which matched a large bevel spurwheel; in fact, all of the wheels in connection with this engine, except the flywheel, were bevel wheels and I can only say that they gave good service. Previous to the installation of the pumps just described, the water from the Stone Slope workings was pumped by a pair of small force pumps that were placed at the lodgement in the mine and driven through two bore holes that were put down from the surface with $1\frac{1}{4}$-inch round iron rods. These rods were driven by a crank shaft and bevel gear which was at first worked by a horse, but later on a small engine was set up which drove the crank shaft with pulleys and belts. The belts were made of green-hide, the hide being cut in strips about 7 in. wide and laced together with lacing of the same material. These belts were made with the hair on them—I have seen strips of red, white, and black hides all in the same belt and it looked very funny. Owing to the high gearing to get power from the little engine, it had to run very fast. All the pulleys were made of wood and were made on the works and pine tar was used on the belts to prevent slipping. Water was very hard to get for the boiler and it was hauled with a horse and cart from Black Brook where it crosses Main Street, in the town of Glace Bay.

The same coal tubs that were used at First Slope were used in the Stone Slope, but a new kind of wheel was introduced. It was known as the grooved or double-flanged wheel. They ran loose on the axle. The axles were all made in the forge from $1\frac{1}{2}$ inch square iron, the ends being swedged down to the size to suit the wheels and a $\frac{3}{8}$ in. collar contracted on to form a shoulder for the wheel to run against, and a flat hole punched in the outer end in which a flat split key was put. A cast iron made from $\frac{1}{2}$ inch square iron with an eye on each end was put on the axle outside of the wheels which kept the axle in place. The rails that were in use in the Stone Slope were known as edge rails. They were bars of $2\frac{1}{2}$ in. x $\frac{5}{8}$ in. iron. The sleepers were made from 3 in. plank and notches were sawn $1\frac{1}{2}$ inches deep at the proper distance apart for the gauge of the track and the rails were drilled to take 5/16 inch plugs at every sleeper and when the rails were put down in the notches in the sleepers, a plug was passed through the hole in the rail and a staple driven over each end of it to fasten down the rail. The Stone Slope was double tracked and the sleepers ran across under both tracks. Double points were used at the slope bottom and on the bank to steer the tubs on the rails. There was only one landing, all the coal came to that landing and the trip was made ready by a bottom-man.

Electric signals were not in use in these days, but instead, the bottom-man had a large tin horn which he would blow when he was ready and the banksman would hear it and give the engineer a wave of his hand to hoist. Later on the old fashioned "rapper" was installed.

The plank first described, was used on the main horse roads in the mine, but in the rooms the tubs were hauled on the pavement and worked very well. The horses hauled the tubs with whiffle-tree and traces in place of shafts. The driver sat on the front of the tub and put his foot against the horses' rump to hold back the tub, and a large piece of leather was attached to the harness which hung over the horses' rump to keep the driver's shoes from skinning the animal. This was called a "backskinner" or "apron." At this time all pit shoes had the bottoms covered with what were then called hob nails. After a few years a new kind of track called metals were introduced. They were in 4 ft. and 6 ft. lengths, made just like the plank road but much smaller. The next change of track was something like the edge rail, but in 4 ft. and 8 ft. lengths. They worked very well, but were easily broken. Finally the wrought iron bridge rail was gotten and also the present Tee rail, and the one-flanged wheel of the present day came into general use; and I must say that it was a good improvement.

For hauling the coal up the Stone Slope, a manilla rope was used for a long time. It was about 2 inches in diameter when dry, but when it was wet and frozen, in the winter time, it was like a 3-in. pipe. The first wire rope that was used was galvanized the same as that in use for rigging on board of ships. The first sockets were the old-fashioned split socket put on with rivets. A shackle and bolt was used to connect the rope to the trip. This bolt was attached to the shackle with a piece of small chain and had a round hole punched in it through which a round leather key was put to prevent the bolt from jumping out while the trip was running. The couplings that were used to couple up the trip were made with one long link and two shackles; the long link being closed in the centre to prevent the shackles from getting separated. A leather key was used in all the coupling pins to keep them from jumping out, the keys were attached to the pins with a piece of rope to keep them from being lost.

The steam boilers in use in these days were of the cylinder type, 33 ft. long and 3 ft. in diameter, and carrying 60 lbs. of steam to the square inch. The boilers were fed with cold water. No water gauge glasses in these days, only try cocks, and only one steam gauge for all boilers and that one would be placed in the engine house. The old-fashioned single acting plunger pumps were used to feed the boilers.

Eleven hours' work was a shift and the wages ran from \$0.35 to \$0.60 per day for boys, and from \$0.60 to \$0.80 per day for labouring men. Blacksmiths, carpenters, and engineers got from \$1.25 to \$1.40 per day. House rent was \$1.50 per month, coal was free to employees, except the haulage which was $12\frac{1}{2}$ cents per load. Single men paid \$0.25 and married men \$0.40 for doctor. Board was \$10.00 per month, tobacco \$0.60 per lb., tea \$0.60 per lb., and rum was \$0.05 a glass.

As a rule the men worked steady, but did not care to work the first day of the month. Pay-day was always on the 15th of each month, unless it happened to be Sunday, in which case Saturday would be pay-day. I have worked in the pit for weeks in the winter time, and did not see daylight except on Sunday. In the summer evenings the young men would have a game of ball called "rounders," or lie on the grass and sing songs and tell the latest yarns, or pitch cents to pass away the time. A number of the men owned boats of their own and would go fishing. Once in awhile, a dance would be given by one of the neighbours and the young people would have a good time. This was called a "frolic." Most every person went to church on Sunday, and it was the desire of the workmen, as a rule, to assist in every way their employers, and a kindly feeling existed between the people generally and the company. So as it has ever been, "from small acorns great oaks grew."

DIAMOND DRILLING AT POINT MAMAINSE, ONTARIO.

An addition to the many valuable reports recently issued by the Mines Branch, of the Dominion Department of Mines contains a record of diamond drilling at Point Mamainse, Ont., with historical and geological notes on the district by Dr. Alfred C. Lane, of Tufts College, Massachusetts. In an introductory chapter Dr. A. W. G. Wilson points out that no systematic detailed geological study has yet been made of the Keweenawan copper bearing amygdaloids in Canadian territory, although various localities where these rocks are exposed have been visited by different geologists from time to time, and special localities have been described. Meanwhile the copper bearing anygdaloids are known to occur on the north shore of Lake Superior, forming a narrow fringe along the shore, and out-cropping on many of the coastal islands. Some excellent exposures are found on St. Ignace Island. Michipicoten Island is wholly underlain by them; the dense vegetation and the soil-cover making, however, their exploration particularly difficult. These rocks also outcrop along the east shore of Lake Superior, between Cape Gargantua and Batchawana Bay. The inner margin of the area has never been fully delineated. Dr. Wilson states that in the vicinity of Mamainse Point it lies, probably, at least five miles inland.

Possibly the first copper mining ever undertaken in Canada was carried on in this locality, and it is known that the Indians in early times collected native copper from the east shore of Lake Superior from which they fashioned weapons and utensils. None of the attempts by corporations to mine copper here in the last century were successful, and no large deposits of ore were discovered; but, as Dr. Wilson remarks, only a very small portion of the district has been explored, and that only imperfectly. In 1906 the Calumet and Heckla Mining Company secured an option on the old Pancake Bay location, near Point Mamainse, and for over a year explored the property by means of diamond drilling. The work was discontinued in 1908. Dr. Lane states that the results cannot be said to indicate that the copper does not exist in commercial quantities, though it indicated that the region was less promising than some others, and that exploration would be relatively difficult and expensive. To quote Dr. Lane briefly on the general geological structure. He says: The point is made up of a series of beds of the Keweenawan or copper-bearing series dipping towards the lake, and veering in strike from s 10 degrees e south of Mica Bay, where they begin, to s. 45 degrees e, or even more easterly as they approach Batchawana Bay. The series is mainly made up of traps and amygdaloids (melaphyres or diabases of other writers) such as everywhere make the bulk of the Keweenawan formation. But there also beds of conglomerates, and instrusive felsites or quartz porhyries, much like those that occur on Keweenaw point, but here containing more green peebles of the Keewatin series, and also granite pebbles. The total column, known in detail, is about 8,580 feet, to which perhaps, 5,000 feet should be added at the base to get the total thickness of the Keweenaw here. The mineralization is of precisely the same type as on Keweenaw point. The native copper occurs with prehnite or with calcite either disseminated in bedded lodes, or in fissures. Some of the fissures probably contain an iron carbonate. The sulphides (chalcocite especially) seem to be confined more to the fissures. The fissuers may have 5 to 7 feet disturbed, but the values seem to be concentrated in a narrow pay shoot of a few inches and are most noticeable when the conglomerate forms one wall of the vein. An easterly shade is universal. The strike generally is nearly north. Dawson describes the veins as crustified, filled with successive deposits from their sides; in several cases agatiform quartz, then quartz, then calcite, the later on the quartz (and also he says vice versa) the copper contemporaneous or even later, also later than some zeolite. The sulphides have similar relations, the copper carbonates are later still. He attributed the deposition of the copper to the electro-chemical decomposition of some soluble salt, probably the sulphate, as an aqueous deposit both in true veins and in vesicular cavities. Dr. Lane states, however, that it is more likely to have been a chloride.

Referring to exploratory work in the section, Dr. Lane after remarking that no successful mines in Michigan are working fissure veins, states that it seems to him that very possibly in this region of flat dips ore bodies are more like those around the Central mine than like those around Portage Lake, and the bulk of the copper might be found near the fissures, since if the beds were relatively flat, circulation would more naturally follow the previous features with greater inclinations. Accordingly he suggests it might be well to follow up the shoots which would be formed by the intersection of the veins and pervious beds, looking for copper either in the vein or in the fissure. The amount of copper disseminated is not dissimilar to that found generally in the Keweenawan rocks. This is shown by a series of sludge analyses.

Another expedition, making three or four that have set out this season, has just started from Ottawa in search for diamonds in Ungava. On the assurance of one of our most distinguished geologists, diamonds undoubtedly occur in Ungava, but the thing is to find them. The authority quoted likened the task to searching for a needle in the bundle of hay. But perchance a lucky man may hit on the needle, or even a careful and systematic search, scientifically conducted, may meet with its reward.

Asbestos, it is reported, has been discovered near Llano, Texas, and the property which has been acquired by the National Asbestos Company of Chicago is now being extensively developed. The outcrop is said to be 250 feet wide and 1,600 feet long, the asbestos belonging to the chrysolite variety. It is not likely, however, that Canadian producers will permit this announcement to cause them much anxiety.

As demonstrating the gross unfairness of "sympathy" strikes, and of the stoppages consequent upon outside striking, a correspondent of the *Colliery Guardian* quotes from the speech of a chairman of one of the important Welsh coal companies, who informed the shareholders at their meeting that the nominal amount of profit was due to the fact that the labour cost had increased 1s. 1.3d. per ton, attributable to a reduction in output caused by labour troubles. Thus, while only one day and a half had been lost through want of trade, no fewer than 65 shifts were lost through strikes, though not one of the disputes was local to the company. During these wanton stoppages, roads had to be maintained, officials paid, etc.; and those, with other charges, had amounted to no less than £25,000.

THE RE-OPENING OF THE GILLIES LIMIT TO PROSPECTORS.

On the recommendation of the Hon. W. H. Hearst, Minister of Mines, the Ontario Government, by an Order-in-Council, dated August 3, has removed the reserve from part of the area known as the Gillies Timber Limit, namely that to the east and north of the Montreal river, which will be open for prospecting after August 20th. The area has been added to the special mining division of Coleman, and brought under Sections 21 and 51 of the Mining Act. The requirements are: (1) The "A" claims or locations already surveyed should be staked out as such. (2) When staking out claims on the blocks which have not been sub-divided, the claims should in no case overlap the boundaries of the blocks, that is, a claim should be staked out wholly within a particular block and not include any portion of an adjoining block or blocks. (3) Claims are not to exceed 20 chains long from north to south or 10 chains wide from east to west; or a total of 20 acres.

The re-opened lands are officially described as: "Reserving therefrom in the above-described areas the right of way of the Cobalt Power Company's transmission line 100 feet wide, 50 feet on each side of the centre line as shown on plan of survey by O. L. Surveyor Homer W. Sutcliffe, dated July 12th, 1909, of record in the Department of Lands, Forests and Mines; the right of way of the Cobalt Hydraulic Company's transmission line being a strip of land 100 feet wide, 50 feet on each side of the centre line, as shown on plan of survey by O. L. Surveyor T. G. Code, dated November 17, 1908, and the right of way of the Mines Power Company's transmission line, being a strip of land 135 feet wide, 67½ feet on each side of the centre line, as shown on plan of survey by O. L. Surveyor Clayton E. Bush, dated November 1, 1909.

"Reserving also the right of the Crown to grant a right of way for a transmission line 100 feet wide, 50 feet on each side of the centre line for the purposes of a pole line and transmitting power from the water power at Fountain Falls on the Montreal river, over any portion of the above-described area.

"Reserving also one chain in perpendicular width along the northeasterly bank of the Montreal river."

"That portion of block 4 lying south of parcels A73 to A80 inclusive, and east of the Montreal river.

"That portion of block 5 lying south of parcel A72 and east of the Montreal river.

"Blocks 6, 7, 8 and that portion of block 9 lying north and east of the Montreal river, excepting therefrom mining location J. S. 32.

"That portion of block 10, lying north and east of the Montreal River.

"As shown on plan of survey by O. L. Surveyor J. H. Smith, dated November 26, 1908, containing by admeasurement 3,302 acres, more or less.

"Being all those portions of the said Gillies Timber Limit still in the Crown bounded on the south by the south limits of blocks 6, 7, 8 and 9, as shown on plan of survey by Ontario Land Surveyor J. H. Smith, dated November 26, 1908, of record in the Department of Lands, Forests and Mines; on the west by the Montreal river and the northwesterly boundary of the Gillies Timber Limit; on the north by the south boundary of that portion of the Gillies Timber Limit subdivided and shown on plan of survey by O. L. Surveyors Speight & Van Nostrand, dated July 7, 1909, of record in the Department of Lands, Forests and Mines; on the east by the northeasterly boundary of the Gillies Timber Limit. Said portions being more particularly enumerated and described as follows, that is to say:

"(1) Parcels A56, A59, A60, A61, A65, A66, A67, A68, A69, A70, A71, A72, A73, A74, A75, A76, A77, A78, A79, A80, A81, A82, A86, A87, A94, A98, as shown on plan of survey by O. L. Surveyors C. H. Fullerton, dated November 9th, 1909, containing by admeasurement 567 acres, more or less.

"(2) That portion of blocks 1, 2 and 3 lying south of parcels A80 to A100 inclusive."

THE MINERAL RESOURCES OF BRITISH COLUMBIA

At Rossland, B.C., on July 30, a valedictory banquet was given to Mr. J. S. C. Fraser, who had for 16 years been manager of the local branch of the Bank of Montreal, and was about to leave for Victoria, having been promoted to the responsible position of manager of the bank's branch in the capital of the province. One of the most important toasts of the evening was that of "The Mining and Smelting Industries," proposed by Mr. S. G. Blaylock, of Trail, assistant general manager of the Consolidated Mining and Smelting Company of Canada, Limited, which company owns, among other properties, a large group of mines in Rossland camp, and extensive copper and lead smelting works and a lead refinery at Trail, distant but a few miles from Rossland. Those selected to respond were Messrs. J. L. Warner, who is opening mining property in what is known as the South Belt of the camp; Mr. E. Hibbert, of Greenwood, in Boundary district, superintendent of mines for the British Columbia Copper Company; Mr. E. Jacobs, of Victoria, and one or two others. Only a brief summary of Mr. Warner's speech has been obtained, while no notes are available of Mr. Hibbert's remarks, nor of those made by Mr. Blaylock in proposing the toast. Mr. Jacobs prepared the following information, taking as his chief subject the mineral resources of the Cordilleran range in Canada, but as the hour was late and there were other toasts to follow, only a brief resume of the prepared address was given to the company, which crowded the banquet hall to its utmost capacity. The full address, however, contains information that will probably be read with interest, so it is printed here:

"Mr. Chairman, Mr. Vice-Chairman, Mr. Fraser, and Gentlemen: It is well known that the mineral resources of British Columbia are enormous, though as yet but little developed. I shall leave it to other gentlemen present to speak of the metallurgical side of the mining industry, and shall confine myself briefly to the mining side, or, rather, to our great mineral resources.

"There are many present who remember Mr. Bernard MacDonald, who, years ago was manager of some of Rossland's largest mines. At the 1903 annual meeting of the Canadian Mining Institute that gentleman read a paper on 'Mining Possibilities of the Canadian Rockies.' Now, I think, we may take it for granted that Mr. MacDonald included in his review of the mineral productions of the Rockies the whole series of mountains more correctly known as the Cordilleran series, for that is the region dealt with in Brock and Young's 'Economic Geology of Canada,' when referring to the great area of mountainous country of British Columbia, part of Alberta, and Yukon Territory. I can only give you excerpts of Mr. MacDonald's paper just now, for my time limit is too short to admit of fuller quotation. Mr. MacDonald said: 'The main source of the precious metals mined within the last three and a half centuries has been the Rocky Mountain regions. The portion of these mountains within Mexico will here be referred to as the Mexican Rockies, that within the United States as the American Rockies, and that within Canada as the Canadian Rockies. . . . The scope of mining referred to here is intended to cover the mining and production of the precious metals only.'

"**Production of Mexican and American Rockies.**—After reviewing the history and progress of mining on this continent from its beginning early in the 16th century, shortly after the discovery of America, and giving as an estimate of the coining value of the total production of gold and silver from the Mexican Rockies during 350 years to the end of 1902, an aggregate value of $5,500,000,000, or an average annual production of $15,714,285 during that long period, and an average amount of $3,142,857 for each mile of the 1,750 miles of length of the Mexican Rockies, Mr. MacDonald said, concerning the American Rockies: 'For 300 years after the production of gold and silver had been commenced in the Mexican Rockies, nothing was done toward the systematic exploration of the northerly extension of this chain of mountains, within the territory now occupied by the United States. After the discovery of placer-gold in California in 1849—53 years ago—numerous expeditions of gold-seekers started from the Eastern States and other parts of the world, for California. At this time the intervening plains—then the Great American Desert, now the most fertile country in the world—lay between, swarming with bands of hostile Indians, while beyond these plains towered the snow-clad Rockies, pathless and unknown except to the fierce tribes of Indians who contested the advance of this invasion. These natural obstacles were soon overcome by the determination of the gold-seekers, but when they reached the mines, they knew nothing about mining or metallurgy, and could not even recognize the common ores of gold and silver. In addition to this lack of technical knowledge, the regions were almost inaccessible, for there were no roads nor even trails. Under these conditions progress was at first slow. As years went by, however, mining and metallurgical knowledge was gradually being acquired and crystallized into science, in the hard but efficient school of practical experience. Transportation facilities were provided, mining machinery invented, and the production of the metals grew accordingly. From such a beginning, 53 years ago, the production of gold and silver from the American Rockies increased year by year until it reached a coining value of about $155,000,000 in the year 1902. This amount brings the total production up to $4,500,000,000 for 53 years since the commencement of mining, being an average annual production of nearly $85,000,000 or $3,461;539 for each mile in length of the 1,300 miles of American Rockies. It will thus be seen, that from a country in which the production of the precious metals was practically nil 53 years ago, the United States, in its production of these metals for 1902 has surpassed that of every other country. This has been made possible only by the vigorous exploitation of that inexhaustible source of gold and silver—the Rocky Mountains.'

"**Production of the Canadian Rockies.**—Continuing, Mr. MacDonald said: 'The Rocky mountains, in their northerly course, after passing through the States of Montana, Idaho, and Washington, enter into the Provinces of British Columbia and Alberta, in Canada, and extend northward through these provinces, and the Yukon and Northwest Territories till they pass into Alaska, or terminate on the shores of the Arctic ocean, in the neighbourhood of the mouth of the Mackenzie river. Within Canadian territory, these mountains have an approximate length of 1,600 miles, by an average breadth of 500 to 800 miles, and possess the same general structural features as they do in their southerly extension into American and Mexican territory. For this reason it is fair to assume that, as already indicated, the Rockies in Canada will yield a quantity of the precious metals equal to that produced by them in American or Mexican territory—mile for mile of their length—when equally developed. The production, therefore, that may be expected from the Canadian Rockies in the future may be seen from a study of the following table:

Country	Miles of Rocky Mountains	Average Production per Mile	Total Value of Production
Mexico	1,700	$3.142.857	$5.500.000.000
United States . .	1.300	3.461.538	4.500.000.000
Canada	1.600	103.750	166.000.000

"'In extenuation for the unfavourable contrast shown by the production of the Canadian Rockies in the past, it may be stated that climatic conditions prevailing in these mountains are less favourable than those prevailing in their extension through the countries to the south. While admitting that the climate, to some extent, hinders exploration and production, undue weight should not be given to this factor, for placer-mining operations, which are more seriously affected by cold than lode-mining, being outdoor work, are carried on successfully in the Klondike, which is practically in the Arctic Circle.

"'That the discovery of other mining camps in these mountains, equally as productive as the Klondike, waits only on the chance efforts of individual prospectors, or the systematic exploration of organized companies, cannot be denied, and no one can place a limit on the number of Cripple Creeks, or Klondikes, or Rands that lie hidden away in the recesses of the 1,600 miles of Rocky mountains now practically unexplored in Canadian territory. A comprehensive, systematic exploration extending over years, can only fully answer this. . . . The problem should be attacked systematically by a well-organized corps of prospectors, operating under the direction of trained geologists. Prospecting in this way could be done only by large private corporations, properly financed, or by the Dominion Government. The inefficiency of the desultory efforts of a few prospectors, working on their own account, to dis-

cover the mineral deposits hidden away in so vast a field will be apparent when it is borne in mind that these mountains, averaging 1,600 miles in length by at least 500 miles in breadth, cover an area of more than 800,000 square miles—eight times the total area of England, Ireland and Scotland.'

"**Some British Columbia Figures.**—Now, gentlemen, I have quoted Mr. MacDonald thus freely, for the reason that he was well known to residents of Rossland in past years, and has since been operating in a large way in Mexico. Those of you who care to do so may read much other information along similar lines in the book, 'Economic Geology of Canada,' I have already mentioned. But to come home to the mineral production of our own province—British Columbia has producted to date minerals aggregating in value more than $400,-000,000. The total officially recorded was $397,696,000 at the end of 1911, and there is now the value of the production of the expired six months of 1912 to add—probably $14,000,000 or $15,000,000—so that an aggregate of about $412,000,000 has been reached. As indicating the rapid advance in production of the two last ten-year periods, the following comparative figures of value are submitted:

For all years to 1891, inclusive	$78,111,539
For ten years, 1892-1901	94,130,449
For ten years, 1902-1911	225,454,734
Aggregate value of production	$397,696,722

"**Enormous Value of Mineral Resources.**—Just to give a faint idea of the estimated enormous value of the mineral resources of British Columbia, I will direct your attention to two estimates only, which include but a small proportion of the whole of the mineral resources of this province. In the 'Annual Report of the Minister of Mines' for 1902, there is a report by the provincial mineralogist on the Cariboo district, from which this brief excerpt has been taken: 'In the Quesnel section alone there must be from 2,500,000,000 to 3,000,000,000 cubic yards of auriferous gravels, which there is every reason to think will be as rich as the Consolidated Cariboo Company's deposit. (Note by E. J.—The Consolidated Cariboo Company recovered about ten cents a yard from a little more than 10,000,-000 cubic yards of gravel.) The immensity of these figures is hard to grasp, but to illustrate—if ten cubic yards yield $1 in gold, then there is in the Quesnel section alone $300,000,000 worth of gold. This vast amount of gold is so diluted with sand and gravel that the only possible means of extracting it is by the use of immense volumes of water under pressure; in other words, by hydraulic mining.'

"**As to Coal.**—Mr. D. B. Dowling, one of the chief coal geologists of the Geological Survey of Canada, in a paper on 'The Undeveloped Coal Resources of Canada,' presented at the 1911 annual meeting of the Canadian Mining Institute, gave a table, relative to coal in British Columbia, showing 'coal areas partially examined and for which an estimate of content might be taken as approximate.' That table gave details; the totals are as follows: Area of coal-bearing territory, 1,351 square miles. Estimated coal content: Anthracite, 61,000,000 tons; bituminous, 39,674,000,000 tons; sub-bituminous and lignite, 490,000,000 tons; total, 40,-225,000,000 tons. It is well known that large additions to this estimate are looked for as the result of further explorations of country for which quite inadequate estimates have hitherto been made.

"**Rossland's Considerable Production.**—Now, gentlemen, I may not further impose upon your patience by giving you still more figures in support of the view that British Columbia possesses great potentialities for wealth in its vast mineral resources, although only the margin of the ocean of information in this connection has been skirted. You will observe that I have not given particulars of the larger individual mining properties or of the different producing districts, but I feel I may ask your attention, in conclusion, just for a few moments longer while I tell you two or three simple facts that you may not have realized are available for use as evidence of the important position of Rossland camp—or to be quite accurate, Trail Mining division, though there has been little production in the division outside of your camp—in comparison with other mining camps of the province, in two particulars especially. The other day the Rossland Miner published a table showing the tonnage of ore and gross value of metals contained therein produced by Rossland mines during the 18-year period, 1849-1911. The figures our good friend Colonel Egan prepared for the Miner show a total of 3,926,278 tons of ore, having a gross value of $52,657,905. Adding the value of the production for 1912, the Miner's aggregate of $55,000,000 to the end of the current year is, in my opinion, well within the mark. But one of the facts in particular I commend to your use whenever some of your neighbours get to crowing about possessing the 'biggest free-milling gold camp in North America' is that Rossland mines have yielded nearly 60 per cent. of the total lode-gold produced in British Columbia during all years to the end of 1911. Of course I am not speaking of placer-gold, but only of lode-gold. Now, when boasters get the 'big head,' you may give them this gentle reminder—the aggregate quantity of lode-gold produced in this province to the end of 1911, as shown by the 'Annual Report of the Minister of Mines,' is 3,183,353 oz. Of this comparatively large quantity, Rossland mines have produced about 1,886,000 oz. This works out, as already said, at nearly 60 per cent. of the whole. Of course, Rossland's total production of approximately 3,300,000 oz. of silver is small in comparison with that of the Slocan, but in copper your camp has made a showing you may also take pride in, though not to the same extent as in your gold figures. The aggregate production of copper in the province for all years to the end of 1911 is 452,281,-365 lbs.; Rossland's proportion of this is approximately 85,000,000 lbs., or well on toward 20 per cent. So you see, gentlemen, you are quite safe in claiming for the mines of your camp—and mainly from the small area occupied by a part of Red Mountain, not, as in the case of other districts from a more or less widely scattered and large area—the very satisfactory percentages I have just told you of. Better still, there is good reason to believe that your mines will continue to make a considerable production for years, for beside the well-founded confidence that Red Mountain mines still contain large reserves of ore that it will pay to mine and smelt, you have brighter prospects in the South Belt than for years past, and good reason to hope for substantial returns from some of the mining properties there. I feel sure that if you could only get behind the reticence of the officials of the Consolidated Mining and Smelting Company, and learn some of their secrets, you would go on in quiet content that Rossland is far

from being the 'dead one' ignorance at times brands it; rather, that it has before it years of productiveness and consequent prosperity.

"I thank you, gentlemen, for your courtesy in listening to my dry figures and other details, and I assure you that I am taking every opportunity open to me to give publicity to the main features and facts contained in what I have said to you here to-night."

THE RATE OF BURNING OF FUSE.

It is important that time fuse should have a uniform rate of burning, and in almost all blasting operations the fuse used is assumed to burn in a regular and uniform manner. When fuse has been subjected to such conditions as to produce acceleration or retardation in its rate of burning it becomes dangerous. Acceleration of the rate of burning increases the liability of a shot going off before the miner has left the face; retardation increases the chnace of the flame in the fuse progressing so slowly that the miner will be injured by a delayed shot when he returns to the working face. All conditions that bring about any marked change in the rate of burning of fuse are dangerous, and from a study of the list of accidents in mines and quarries each year injury and loss of life are seemingly often brought about by such conditions. The question has been recently investigated by Messrs. W. O. Snelling and W. C. Cope, of the staff of the U. S. Bureau of Mines, whose report is eminently informative. The conditions that are believed to be most active in bringing about either a retardation or an acceleration in the rate of burning of time fuse are classified under effects due to: (a) pressure; (b) temperature; (c) moisture; (d) mechanical injury. Under ordinary conditions nearly all types of fuse show great uniformity in their rate of burning. Practically all types of fuse examined by the investigators had a total variation in their rate of burning under normal conditions of less than 20 per cent., and all would have passed under the allowance of "no variation greater than 10 per cent. above or 10 per cent below the average rate of burning.

Under the influence of pressure practically all types of fuse are subject to wide variation in their rate of burning. Such pressure as can readily be produced by the confinement of the gases evolved by the burning fuse itself is sufficient to increase the normal rate of burning from 92½ seconds per meter (28.2 seconds per foot) to 21 seconds per meter (6.4 seconds per foot). Thus, even confinement will cause fuse to burn from three to four times as rapidly as its normal rate. In experiments made with fuse confined by stemming of various kinds wide variations in the rate of burning were noted, and whenever lengths of fuse are confined by stemming or other materials impervious to gas, a sufficient length of the fuse should be used to allow for the increased rate of burning due to the pressure produced by the evolved gases.

High temperature causes a marked retardation in the rate of burning of fuse, and storage for even a short period of time near boilers, or wherever the temperature may be high, is sufficient either to cause "misfires" or to retard the rate of burning of the fuse so much as to greatly increase the liability to "holdbacks," delay shots, etc. It is probable that many of the difficulties that are sometimes encountered in regard to fuse burning too slowly and causing delayed shots are due, in part at least, to such fuse having been kept in too warm a place. Fuse that is not intended for use in wet places (cotton fuse, etc), does not suffer marked change in its normal rate of burning by reason of the effect of high temperatures, whereas the more completely waterproofed types of fuse show increasingly great effects from heat. Even exposure to comparatively low temperatures for considerable lengths of time causes marked retardation in the rate of burning of such fuse, and exposure to a fairly high temperature for even a short length of time may cause certain types of fuse to burn from three to five times as slowly as their usual rate. To insure the best results, fuse should always be protected from extremes of temperature.

Climatic conditions affect to a considerable extent the rate of burning of the less waterproof types of fuse. Damp fuse burns more slowly than normal fuse, and fuse that has been wet and then thoroughly dried tends to burn at a rather slow rate, and may even cause delayed shots by smouldering for a considerable time. Fuse containing several wrappings of tape saturated with tar or asphalt resists moisture to a considerable extent, and may be used for firing shots under water, provided the fuse is not allowed to remain too long a time in contact with water before the shot is fired.

It is, of course, evident that when these waterproofed types of fuse do become wet, whether through storage for a long time in a damp place or through exposure to water after the protecting layers of asphalt or gutta-percha are mechanically abraded or injured in any other way, they are more difficult to dry out than are other types of fuse, and are more liable to burn at a rate slower than the normal rate.

Fuse that has been subjected to actual mechanical injury particularly to hammering or pounding, or the blows of falling rock, etc., has a greatly increased rate of burning, and sometimes burns so rapidly as to be almost instantaneous in its action. The mere bending, coiling, and twisting of fuse, such as would be brought about by forcibly placing within a bore hole a length of fuse considerably greater than the depth of the bore hole, does not produce any marked change in the rate of burning, but pounding or direct abrasion of fuse greatly increases that rate. Fuse that has been injured by severe abrasion or by too great pressure from any cause should not be used in any work where adjustment of the rate of burning is desired.

As a final summary it may be stated that ordinary fuse may under some conditions burn as fast as three seconds per meter (one second per foot), and under other conditions it may burn as slowly as 745 seconds per meter (227 seconds per foot). The former rate is more than 200 times as fast as the latter, and each is widely removed from the normal rate of burning of similar brands of fuse. Hence, the condition and past history of any roll of fuse is an important matter, and in mining and blasting operations the safety of the miner demands that only fuse that has been carefully stored and kept from unfavourable conditions shall be used.

OBITUARY.

The death occurred at Houghton, Mich., on the 6th ultimo, of Capt. William A. Dunn, at the age of 71 years. The deceased was born at Glengarry, Ont., but going to the United States some forty years ago, became prominently identified with the copper industry in the Lake Superior region.

Mr. R. B. Nickerson, a member of the Canadian Mining Institute for many years, and recently manager of the Mikado and Laurentian mines in the Manitou district of Ontario, died in California on the 14th ultimo.

CURRENT TECHNICAL LITERATURE

ORE DRESSING.

Pebbles for Tube-Milling.—Mr. A. W. Allen contributes an article to the Mining Magazine for July on this subject. Gold and silver ores are reground or slimed by means of pebbles or stones; and the highest efficiency is obtained where hardness is combined with toughness in the grinding medium. Water-worn flints, imported from Europe, generally meet the case; but there are numerous instances where the cost is prohibitive and where recourse must be had to a local stone. It may be said that the quality of the stone used for grinding is immaterial as long as it contains metal in remunerative quantities. One point, however, must not be overlooked; the fact that the quality of the stone selected should bear some ratio to the degree of grinding required. A soft stone will chip or fracture to an extent that will make "all sliming" an impossibility. So much stone will require to be added to keep the mill supplied with a normal load of pebbles that the classified under-size will increase on the over-size; and the result will be obvious. There are cases where an ore of the same class as that being milled can be used for re-grinding purposes; but it is doubtful whether this is practicable where the whole of the ore, together with the added stone, has to be reduced to slime in the mill. In the latter case the highest duty can only be obtained by the use of the best grinding medium. For testing stone that may be locally available, the author describes an apparatus employed by Mr. E. J. Lovegrove in rock testing for this purpose. "The testing apparatus consisted of three rotating cast iron cylinders driven by a gas engine through a counter shaft and bevel gearing, enabling three samples to be tested simultaneously. The cylinders are 11-inch internal diameter, with three 1-in. by 1-in. angle iron ribs bolted lengthwise in the inside at equal distances apart and parallel to the axis of rotation." The machines used resemble miniature tube mills with Komata lining. The samples are broken to a 2-in. gauge, numbering about 16 stones, and weighing about 4 pounds. The number of revolutions recorded by the counter is confined to 8,000, and the speed to 20 revolutions a minute. Tests of each class of stone were made under both wet and dry conditions and the percentage of chips and dust produced, as compared with the original weight, was used to estimate a value for the particular stone. As a result of certain tests, quartzites, would seem to hold the premier position. Other experiments made in the United States, indicated that porphyries and porphyrites were in view of their hardness and toughness, superior to all other rocks. It may be stated that an attempt to make use of quartzite for fine grinding at a mine in Ontario proved unsuccessful.

TUNGSTEN.

The Tungsten Mining Industry in New South Wales.—An admirable monograph has been issued by the Geological Survey of New South Wales, by Mr. J. E. Carne, assistant Government Geologist, on the above subject. In addition, however, the report contains much information of a general character and of wide application. In this regard the chapters on the concentration of tungsten ores and on the genesis, and mode of occurrence of tungsten deposits are notably valuable. In dressing the News South Wales practice differs somewhat from the American. Heavy stamps (1,000 to 1,250 lbs.), are employed for crushing. The discharge screens of the stamper boxes are wire-wove, and uniformly 64 holes to the square inch. Concentration is effected with Wilfley, Card, Woodbury, Krupp, and Ferrari's tables, and Frue vanners; concave buddles, and blanket tables or launders. The buddles are dead or stationary; trailing chains or extemporarized brushes are used to form circular riffles, or keep the surface of the sediment even.

Tungsten occurs in New South Wales as scheelite and wolfram, and also in rarer form. The scheelite ore has been proved over an area of approximately four miles in length by two miles in width, though the actual value of the mineralized belt is said to be very patchy. According to one authority numerous veins of scheelite occur in the gneissic granite, and near its contact with the spotted slates of the locality. At times the occurrences appear to be true fissure veins, at others they appear to fill contraction fissures in the granite. Dykes of varying composition and texture at times accompany the scheelite. The reefs, as shown by a study of these dykes, appear to be referable to at least two periods of vein formation, one set originating not long after the consolidation of the upper granite mass, another forming a secretion from a magna producing a later set of dykes. Another writer states that the scheelite occurs in true fissures, both in granite and slate. Dykes of various degrees of basicity (chiefly intermediate) often accompany the reefs. The reefs apparently owe their existence to the action of this dyke series, which cuts alike both the granite porphyry and the diorite of the district. The igneous rocks appear either: (1) To have caused vigorous circulation of water by heating through the older granite porphyry, thereby causing segregation of the contained scheelite; (2) or to have caused a hydrated excretion to be given off by a deeply seated magma, whose earlier differentations resulted in the dyke formations themselves. This hydrated excretion would contain the scheelite.

New Application of Tungsten and Molybdenum.—Prior to their production in ductile form, the two metals tungsten and molybdenum had but two applications each; in steel making, and in electric lamps, the tungsten for filaments, and the molybdenum for filament supports. This last use is even better served by the drawn wires, and the majority of the tungsten lights now made in this country contain drawn filaments.

The tungsten or molybdenum-wound electric furnace has proved both cheaper than and superior to the platinum-wound furnace, both because of higher temperatures and quicker heating. Both metals form good substitutes for platinum, platinum-iridium, or iridium, in various contact-making-and-breaking devices. That this is the case, is the result of the good heat conductivity of the ductile forms of these metals, their relative cheapness allowing the use of comparatively large masses, both of these factors preventing the formation of a heavy non-conducting oxide coating, while under the conditions existing in these contacts the thin oxide coatings are conductors.

In the Rontgen tube tungsten has opened up a new field. Owing to its higher melting point, as compared with platinum, tungsten gives the Rontgen ray operator an indestructible target, upon which the cathode rays may be more closely focused, resulting in sharper definition and shorter exposure.

The use of wrought tungsten for projectiles is being carefully considered. Its high specific gravity, 19.3, as compared with lead, appears to give it the theoretical advantages of a flatter trajectory and longer range. Its hardness and high tensile strength should give it high penetrating power. Its high melting point will prevent fusion due to the heat from the charge and consequent erratic flight. Against this, however, is the possibility that the smaller tungsten bullet of the same weight as a copper-nickel-jacketed lead one will possess in an aggravated degree the disadvantage of the latter —unless it hits a man in a vital spot it doesn't stop him.

COAL.

Miner's Electric Lamp.—There is a growing tendency to employ portable electric lamps for underground work in collieries in Great Britain, and a number of new types are being placed on the market. One of the latest is of the accumulator type, and provision has been taken against danger from accidental sparking of short-circuiting. The two cells are connected by a fusible wire which melts immediately when the two poles are connected by a short circuit, and so prevents the possibility of a fire from this source. The fusible wire is completely covered and protected from acid. In the terminals the conducting wire is brought into direct contact with the lead lug of the plates, and held firmly against it by the screw stopper. The socket into which the screw stopper fits forms a complete protection of this junction, and the spot where connection and disconnection is made, and where consequently sparking may occur, is completely enclosed. The stopper may be used to switch the current off or on, and may also be removed for changing batteries in any mine with safety. The lamp itself is constructed to focus about half of the light to illuminate objects at a considerable distance, and diffuse the other half over a wide area for nearer objects.

Gold in Coal.—Mining Science states that an interesting feature about the coal mined at Cambria, Wyo., U.S.A., is that it is claimed to be gold-bearing. Some of the coal has contained as much as $2 per ton in gold, and the coal was sold for only $1.50 per ton. When coke made at Cambria was selling for $3.50 per ton, samples were taken from 31 cars during a period of three weeks and assayed. The samples showed an average of $1.50 per ton in gold and 0.25c. in silver. The explanation offered for the presence of gold in this coal is that the sands which submerged the old peat bog and now form the roof of the coal bed were derived in part from gold-bearing alluvium. While the sand was being deposited the gold worked down into the underlying bog, and is now found in the coal.

GOLD.

The Domes of Nova Scotia.—Replying to a comment on his paper, "The Domes of Nova Scotia," recently contributed by Mr. T. R. Rickard to the Institution of Mining and Metallurgy and to the Canadian Mining Institute, the author states: "It has been assumed by earlier investigators that the granite was extruded after the gold veins had been formed, and that the enrichment of the quartz bears no relation to the existence of the granite. At Forest Hill, near the Strathcona mine, a narrow apophysis or thread-like protrusion of granite is seen (along the surface of the ground), between the bedding planes of the slate. It is bordered by small veins of quartz, apparently intermittent, but actually continuous, although dwindling in places from a maximum of 2½ inches to a mere thread. This quartz shows mica, while the granite is quartzified, so that they tend to resemble each other; in some spots it is difficult to differentiate, at others the distinction is readily obvious...... The quartz extends into the granite in places and is evidently of later origin. Other structural conditions also indicate that the quartz was formed after the granite, for the evidence does not favour the idea that the granite penetrated pre-existing quartz and split a small vein so as to divide it equally. The order of formation obviously was: slate, granite, quartz, gold. Thus the precipitation of the gold was probably a sequel to the thermal activity that ensued upon the irruption of the granite. Eleswhere in the vicinity the granite contains quartz identical in appearance with that of the bordering veins, and this quartz in the granite exhibits a tendency to form a connected series of impregnations such as would constitute a vein. According to J. C. McDonald, of Forest Hill, a vein 5 ft. wide containing chalcopyrite and mispickel traverses the granite at County Harbour.

SILVER-LEAD.

East Kootenay, British Columbia.—The June number of Economic Geology contains an article by Mr. S. F Schofield of very considerable interest at the present time, in view of the developments now taking place in this section of British Columbia. It discusses the origin of the silver-lead deposits of East Kootenay, but refers more particularly to those of the Sullivan Mine at Marysville, and of the St. Eugene Mine at Moyie. It is common knowledge that the latter is rapidly approaching exhaustion, if not exhausted; on the other hand, the Sullivan, under the management of the present owners, has within the last year or so assumed a more important position among the productive silver-lead mines of British Columbia than at any previous time in its history. This is shown in the statement that the mines' total output from 1894 to June 30, 1911, represented 126,175 tons, containing 1,040,369 ounces of silver and 52,840,751 pounds of lead, with a total gross value of $2,566,449. While for the year only, ending June 30, 1911, the production was 34,065 tons of crude ore, containing 258,375 ounces of silver and 14,187,354 pounds of lead, having a total gross value of $635,223, or practically 25 per cent. of the total production covering a period of fifteen years. After describing the geological relations, the author states that the ore-body of Sullivan is a conformable replacement of fine-grained argillaceous quartzites by fine-grained galena zinc blende and iron sulphides. The gangue minerals are often in idiomorphic crystals and free from sulphides. Also, the small cracks in the gangue minerals are filled with a mixture of pyrite pyrroholite, zinc blende and galena. It is, therefore, concluded that the gangue minerals have priority in formation. The passage for the ore solution which formed the Sullivan deposit is believed to be the well-defined bedding planes of the quartzitic strata. From several such channels the solutions replaced the country rock within their sphere of influence. The deposit of the St. Eugene, which yielded to June 30, 1911, silver-lead to the gross value of over ten million dollars, occurs in a zone of fissuring which cuts across the axis of a northern plunging anticline composed of argillaceous quartzites. The ore-bodies are replacement deposits in the heavy-bedded purer quartzites and are restricted to the fractured area between the two main fissures. The ore consists mainly of coarse-grained galena with zinc blende, pyrite, pyrrhotite, magnetite and chalcopyrite

in subordinate quantity. Magnetite was the first mineral deposited, and was followed by the gangue minerals. The presence of the diagnostic minerals, garnet, diopside, actinolite and muscovite, which are entirely restricted to the ore deposit and absent from the surrounding quartzites, suggests that the deposition of the ore took place in the deeper vein zone under conditions of temperature and pressure, comparable to those of contact metamorphic deposits. Comparison is made between these deposits with those of the Coeur d'Alenes, by which the genetic relationships are still more clearly established.

RUSTING OF IRON.

Influence of Painting on the Rusting of Iron.—It is a general belief that good painting will afford an efficient protection against rusting, provided the paint be itself non-corrosive, uniform, impermeable to moisture, and non-porous; but, according to a statement published by Messrs. Erik Liebreich and Fitz Spitzer, of Berlin, one coat of paint or varnish may protect iron, but the application of several coats will actually promote rusting. This pronouncement is made after intensive experimentation. Potential differences were observed between iron wires coated with paint (consisting of linseed oil and sane oxide) and the bare iron wire, when both wires were dipped into salt solution. In a paper read before the Schiffbontechnische Gesellschaft in 1905, Ragg had already demonstrated that all paints show a potential difference against iron.

PERSONAL AND GENERAL

Mr. L. E. Ives has resigned as an associate editor of the Engineering and Mining Journal, to become mining and assistant engineer editor of the Iron Trade Review.

Mr. H. E. Jones, a mining engineer recently in charge of mines in Rhodesia, visited the Cobalt and Porcupine districts last week.

A general committee representing the engineering societies of the British Empire and of the United States of America has been formed to carry into effect a proposal for the erection in Westminster Abbey of a memorial window to the late Lord Kelvin, and contributions to the fund are invited. The Canadian members of the committee are Messrs. W. F. Tye, H. Holgate, H. H. Vaughan, and C. H. McLeod.

Mr. F. G. Stevens, mining engineer, Kingston, Ont., was in Toronto on business on August 1.

Mr. W. E. H. Carter, of Carter & Smith, mining engineers, Toronto, is on a lengthy professional tour of North-western Alberta.

Messrs. J. B. and K. D. Woodworth, of the O'Brien mine, Miller Lake, are accredited with the honour of being the first to journey to Elk Lake by triumphal motor car, the road being now sufficiently passable for slow driving. Except for an encounter with a large black bear, an experience, alarming alike, it is said, to the occupants of the car and to the animal, the journey was without incident.

Mr. Ivan Delashmutt has succeeded Mr. W. Leete as superintendent of the Hobson Silver-Lead Company, at Ymir, B. C.

Mr. J. J. Drummond, when in St. John, N. B., recently, stated that the conditions were such as to indicate that a modern steel works would be established at Courtney Bay in the near future.

Mr. Thomas Graham, chief mine inspector of British Columbia, recently returned to Victoria from attending the annual convention of the United States' Mine Inspectors' Institute, held in Columbus, Ohio.

It is a matter of congratulation that the Porcupine camp will not lose Mr. C. H. Poirier as a resident (as has been reported) at least until September. He may then resume general consulting work in New York, where he has always retained an office. In that event he will be retained by the Porcupine Gold Mines in a consulting capacity.

After opening the recording office at Porcupine and remaining in the camp for two years and seven months, Mr. E. D. Bruce has resigned that position to accept a post under Mr. J. F. Whitson, commissioner of colonization in Northern Ontario. Mr. Bruce has ever earned a title for impartiality and efficiency in his position, which make his resignation appear a great loss to the Porcupine district.

Mr. R. B. Watson, general manager, and Mr. Hugh Parks, superintendent of the Nipissing mines, have returned to Cobalt from Appleton, Wis.

Mr. A. W. Anderson, a member of the Hollinger mine's staff, at Porcupine has undergone an operation for appendicitis.

Mr. Charles Fergie returned to Montreal on August 5th from Lethbridge and left a week later for Halifax to spend a brief holiday.

Mr Fraser Reid, mill superintendent at the Coniagas mines, Cobalt, has gone to Fort Wayne, Ind., on a short visit.

Mr. Charles N. Henrotin has resigned the superintendency of the underground work at the Dome mine, Porcupine, to assume new duties at Copper Cliff.

Dr. W. G. Miller, Mr. R. W. Brock, Mr. R. G. Brigstoke and Mr. T. Denis were in Montreal on August 2nd in order to be present at a special meeting of the Council of the Canadian Mining Institute, held on that date.

Mr. R. O. Sweezey, of Quebec, recently visited the Harricana district. He states that the gold so far discovered there occurs in very small veins, but that nevertheless the indications in the district are not unpromising.

Mr. Kirby Thomas, consulting mining engineer of New York, is visiting nickel properties in the Sudbury district.

Mr. P. A. Robbins, manager of the Hollinger mines, was in Montreal last week.

Dr. R. A. Daly is leaving the Massachusetts Institute of Technology to occupy the Chair of Geology at Harvard.

Sir William Meredith, appointed a Commissioner by the Ontario Government to take evidence and otherwise secure information preliminary to the framing of Provincial Workmen's Compensation Act, leaves shortly for England to study the operation of the British law in this respect. He expects to complete his report upon his return to Toronto later in the year, and a bill will probably be introduced to the Legislature at its next session.

Mr. Elias Rogers, president of the Crow's Nest Pass Coal Company, when in Victoria recently, stated in a press interview that he feared the effect of the use of oil as fuel on locomotives would be serious so far, at any rate, as it concerned the collieries in the Crow's Nest. Already, he said, there was evidenced a noticeable decrease in the demand for coal, amounting to 1,200 tons a day, from his own company. On the other hand, the demand for coke for metallurgical purposes is steadily maintained, while with the activity now prevailing in the Kootenays, this demand is likely to steadily increase.

Mr. J. B. Cleveland, formerly manager of the West Dome mine, at Porcupine, is now manager of the Hudson Bay-Porcupine.

Mr. G. J. Kapteyn has removed from Swastika to New Year, Montana.

Dr. E. M. Kindle, of Washington ,D.C., has been appointed to the office of invetebrate paleontologist on the staff of the Canadian Geological Survey.

Mr. A. E. Hall, of the staff of the Dome mine, Porcupine, is in New York.

Mr. Arthur A. Cole, mining engineer for the Temiskaming and Northern Ontario Railway Commission, was in Montreal in the last week of July on official business.

Mr. O. E. LeRoy is in the Boundary district, B.C.

Mr. T. Walter Beam, of Denver, Colorado, was in Nelson mining division, British Columbia, during July.

Mr. W. M. Brewer, of Victoria, B.C., has been in San Francisco, lately, whence he has taken to Alaska a two-stamp mill.

Mr. D. J. Browne, of Rossland, has taken charge, in the capacity of acting superintendent, of the Van Roi Mining Company's silver-lead mine, situated near Silverton, Slocan Lake, B.C.

Mons. J. J. Fleutot, of Paris, France, has been in British Columbia lately, in connection with some mining investments in that province, of himself and associates.

Mons. A. Fournier, of Kaslo, has been appointed liquidator of the Selkirk Mining Company, which several years ago acquired the Cork mine and concentrating mill, on the south fork of Kaslo creek, and for some time operated them.

Mr. Thomas Graham, chief inspector of mines for British Columbia, has returned to Victoria from visiting the testing station of the United States Bureau of Mines, Pittsburgh, Pennsylvania, and some representative coal mines in Illinois, following attendance at annual convention of American Mine Inspectors, held in Columbus, Ohio, a few weeks ago.

Mr. F. C. Greene, general manager for the Graham Island (British Columbia) Coal and Timber Syndicate, which has been boring for coal on Graham Island of the Queen Charlotte group, was down from the north in July, and spent some time in the Coast cities.

Mr. J. Cleveland Haas left Spokane, Washington, late in July, on a visit to mining property in California.

Mr. E. Jacobs, of Victoria, B.C., has been spending six or seven weeks in the Boundary and Kootenay districts of British Columbia. At the end of July he attended, as an invited guest, the meeting of the Spokane section of the American Institute of Mining Engineers, held at Republic, Washington.

Mr. F. C. Languth is in charge of the Motherlode Sheep Creek Mining Company's 10-stamp mill and cyanide plant which in June commenced operations in Sheep Creek camp, Nelson mining division, British Columbia.

Mr. Douglas Lay, superintendent of the Van Roi Mining Company's mine and mill in Slocan district, B.C., has gone to England, with his wife and child, on a three months' holiday visit.

Mr. O. E. LeRoy was in the Boundary district of British Columbia in the last week of July, in connection with the preliminary work of arranging for the visit to that district next year of delegates to the International Geological Congress, Toronto.

Mr. David Little, formerly in charge of the Second Relief mine and stamp-mill at Erie, Nelson mining division, B.C., went to Republic camp at the end of July to look into conditions there.

Mr. David W. Moore, for years ore-buyer for the smelting works at Trail, B.C., but afterward resident in Victoria, died on July 13 at Revelstoke, when in that district, in connection with the work of obtaining information, relative to the mineral and timber resources of the Big Bend of the Columbia country, he had undertaken for the provincial government.

Mr. A. R. Nickels, a graduate of the "Boston Tech." has gone to Greenwood, B.C., as assistant to the superintendent of the British Columbia Copper Company's smeltery.

Mr. Sidney Norman, who about ten or twelve years ago was operating in the Slocan district of British Columbia, and afterwards was connected with the American Mining Review, Los Angeles, California, now has his headquarters in Spokane, Washington.

Dr. Heinrich Ries, of Cornell University, has been on the Coast of British Columbia lately, continuing his investigations relative to the clays and clay deposits of western Canada, for the Canada Department of Mines.

Mr. Ernest Waterman ,of Princeton, Similkameen, B.C., general manager of the Princeton Coal and Land Company, was in Spokane, Wash., and West Kootenay, B.C., on a business trip, in July.

Mr. H. E. T. Haultain and Mr. Geo. A. Guess have formed a partnership and have opened an office with the firm name of Guess and Haultain, mining and metallurgical engineers, 306 Star Building, Toronto. Both Mr. Haultain and Mr. Guess are too well-known to our readers to require further introduction.

Mr. Sydney Smith, of Haileybury, Ont., has gone to Juneau, Alaska, where he will probably reside for some time.

Mr. J. D. Kendall, consulting mining engineer, of London, England, is visiting his son, Mr. Cosmo Kendall, who is in charge of the Bell graphite mine at Buckingham, Que.

The Jeffrey Mfg. Co. have moved their Chicago headquarters and offices from the Fisher Bldg. to the McCormick Bldg., which is considered the most modern and up-to-date fireproof office building in Chicago.

Mr. S. S. Shive, sales engineer, is the district manager in charge of the Chicago office, and Jeffrey customers and friends will find a welcome on the 17th floor where the Jeffrey offices are located.

The Jeffrey Mfg. Co. maintains fourteen branch offices in the United States and over one hundred agents in the leading commercial centres all over the world.

ALASKA COAL AND THE PACIFIC COAST FUEL SUPPLY.

In a paper read recently before the Association of American Geographers, on the subject of "Geography in the Development of Alaskan Coal," Mr. Alfred H. Brooks, chief of the Alaska division of the United States Geological Survey, presented certain information respecting the coal resources of Alaska that may well be taken into account in the consideration of the fuel industry of the Pacific Coast, by which of course, is included British Columbia. At present as is well known a very considerable proportion of the production of the Vancouver Island collieries is marketed in Puget Sound, and although, in recent years, oil has in a large degree replaced coal for all purposes other than domestic in San Francisco, once the principal market for the coals of Vancouver Island, there is still a considerable exportation to that and other industrial centres on the American seaboard. Heretofore there has been no western competition, but coal from so far distant as Australia has been sold at competitive rates in San Francisco with the British Columbia product.

Mr Brooks estimates, meanwhile, that Alaska contains 150,000 million tons of coal, or about 4½ per cent. of the total estimated tonnage of the United States, or about a third more than the original coal supply of Pennsylvania. Much of this, however, is low grade and the whole very widely distributed. Hence to afford a more precise means of guaging the economic importance of these resources, he divides the coal fields into three economic provinces based on geography. The first is the Pacific slope, which comprises the mountainous area drained to the Pacific ocean. This province as a whole is readily accessible and its resources may be considered an asset of the present generation. It contains about 40 per cent. of the known coal resources of Alaska. Some of this coal is of grade and favourably situated for export. The coal of the second province is shown to have value only as a local population and industries develop; while that of the third province namely the Arctic slope, will not be drawn upon until that future time when the more accessible coals of the world approach exhaustion.

The estimated reserves of the Pacific slope fields are placed at 60,000 million tons, much of which can be made readily available by the construction of railways. The position of these coals relative to transportation is favourable. There are large quantities of lignitic, with some sub-bituminous coals, which are on or close to tidewater. The fields of high grade coals can be reached from open ports on the Pacific by railways from 30 to 200 miles in length. From the coastal terminals of these railways to Puget Sound ports the distance is about 1,200 to 1,400 miles and about 2,000 miles to San Francisco. The coals, it is argued, are, therefore available for the use of the Pacific Coast States, whose five million people are the natural customers for that surplus of high grade coal which cannot be locally consumed, yet must be mined to warrant the establishment of the mining industry on a profitable scale. In other words, as Alaska now uses only about 100,000 tons of coal annually, an export trade must be established to warrant the large investments needed to develop the coal fields.

DETERIORATION OF COAL IN STORAGE.

The United States Bureau of Mines has issued a preliminary report on the deterioration and spontaneous heating of coal in storage. In view of the very general opinion that the heat units in the volatile part of coal are lost by the storage of coal under conditions where it is exposed to the atmosphere for any length of time, the result of tests made by this bureau are interesting, as to a large degree disproving this theory. The coal tester was in 20 lb. samples and represented a variety of types from widely separated fields. Each sample had been broken in the mine to fragments, each of about half an inch, and these were at once placed in glass bottles for consignment to the laboratory. At the laboratory the accumulated gas was withdrawn and the volatile products were permitted to escape at atmospheric pressure and temperature. Although several coals evolve methane in large volumes, especially in the early period after mining, the coals tested lost in one year from this cause only 0.16 per cent. at most of their calorific value. More elaborate tests were undertaken at the instance of the U. S. Navy Department, to determine the total loss possible in high-grade coal by weathering; and the extent of the saving to be accomplished by water submergence as compared with open-air storage, as well as to ascertain whether salt water possessed any peculiar advantage or disadvantage over fresh water for this purpose. The result of these tests showed that certain coals suffered practically no loss of calorific value after a year's exposure. others, however, notably a sub-bituminous coal from Wyoming, deteriorated in heat value 5.3 per cent. during storage for two and three-quarter years, and more than 2.5 per cent. in the first three months. But this was an extreme case. It was found that storage under water unquestionably preserves the heating value and the physical strength of coal, fresh or salt water serving equally well. But such storage practically makes necessary the firing of wet coal, and consequently the evaporation in the furnace of added moisture varying in amount from 1 to 15 per cent., according to the class of coal. Submerged storage is an absolute preventive of spontaneous combustion, and on that account alone it may be justified when the coal is particularly dangerous to store and when large quantities are to be stored; but unless the storage period is to be longer than a year, there seems to be no ground for storing coal under water merely for the sake of the saving in calorific value to be obtained by the avoidance of weathering.

The report, however, proceeds to state that losses of value from spontaneous heating are a much more serious matter than the deterioration of coal at ordinary temperatures. Thus oxidation proceeds more rapidly as the temperature rises. When the storage conditions are such as to allow warming of the coal to a temperature of about 100 C., the rate of oxidation becomes so great that the heat developed in a given time ordinarily exceeds the heat dissipated, and the temperature rises until, if the air supply is adequate, the coal takes fire. Spontaneous combustion is brought about by slow oxidation in an air supply sufficient to support oxidation, but insufficient to carry away all the heat formed. The area of surface exposed to oxidation by a given mass of any one coal determines largely the amount of oxidation that takes place in the mass; it depends on the size of the particles and increases rapidly as the fineness approaches dust. Ideal conditions for such heating are offered by a mixture of lump and fine coal, such as run-of-mine with a large percentage of dust, piled so that a small supply of air is admitted to the interior of the pile.

The following suggestions are offered on storing coal:

1. Do not pile over 12 feet deep, nor so that any point

in the interior of the pile will be over 10 feet from an air-cooled surface.

2. If possible, store only screened lump coal.

3. Keep out dust as much as possible; to this end reduce handling to a minimum.

4. Pile so that lump and fine are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile.

5. Re-handle and screen after two months, if practicable.

6. Do not store near external sources of heat, even though the heat transmitted be moderate.

7. Allow six weeks' "seasoning" after mining and before storing.

8. Avoid alternate wetting and drying.

9. Avoid admission of air to the interior of the pile through interstices around foreign objects, such as timbers or irregular brickwork, or through porous bottoms, such as coarse cinders.

10. Do not try to ventilate by pipes, or more harm may be done than good.

CANADIAN MINING INSTITUTE.

At a special meeting of the Council of the Institute held on the 2nd inst., the following new members and associates were elected: Mr. G. H. F. Adams, Hollinger Gold Mines, Timmins, Ont.; Mr. Philip E. Billinghurst, 1236 Howe st., Vancouver, B.C.; Mr. H. E. Cawley, Cobalt, Ont.; Mr. J. D. Fraser, Atikokan Iron Co., Port Arthur, Ont.; Mr. Russel R. Grant, 961 Gerrard street east, Toronto; Mr. Winthrop K. Harding, 207 Somerset Building, Wininpeg; Mr. Wm. B. Hargraves, Schumacher, Ont.; Mr. Charles M. Henrotin, Dome Mines, South Porcupine, Ont.; Mr. P. S. Hopkins, Schumacher, Ont.; Mr. George E. Leighton, Montreal, Que.; Mr. Robert Livermore, Kerr Lake Mine, Cobalt, Ont.; Mr. Alexander Mackay, 18 Meadow Road, Pinnes, Middlesex, Eng.; Mr. Richard S. McCaffery, University of Idaho, Moscow, Idaho; Mr. Thos. Morrison, Bancroft, Ont.; Mr. Noble W. Pirrie, 152 Trounce Alley, Vancouver, B.C.; Mr. J. R. Rutherford, Hollinger Gold Mines, Timmins, Ont.; Mr. A. L. Sharp, Garson Mine, near Sudbury, Ont.; Mr. N. M. Yuile, Diamond Flint Glass Co., Montreal. Associates: Dr. H. M. McNeill, South Porcupine, Ont.; Mr. Wm. H. Merrill, 27 Maitland st., Toronto, Ont.

INDUSTRIAL NOTES.

The Canadian Car and Foundry Company, Limited, has distributed the tenth quarterly dividend of 1¾ per cent. on the preference shares.

The cement works of the Keystone Portland Cement Company at Blairmore are nearing completion, and manufacturing, it is expected, will commence in the course of the next few months. Already orders have been booked ahead for a year's output, or over 300,000 barrels.

Mr. J. D. McDonald, general superintendent of the West Kootenay Power & Light Company, is reported as stating that in anticipation of the electrification of the Canadian Pacific Railway's line between Rossland and Castlegar next year, it is proposed to at once increase the capacity of the Power Company's plant at Bonnington Falls.

MINING ACCIDENTS IN QUEBEC IN 1911.

Mr. J. H. Valiquette in his report to the Quebec Department of Mines on mining accidents in the province during 1911, notes that the number of men employed in the industry was 7,846, of which 3,686 were employed in metalliferous (including asbestos and mica) mines, and 4,160 in quarries, clay-pits and brickyards. As compared with the returns for 1910, the fatalities in 1911, of which four are recorded, show a decrease. Of the fatal accidents, three occurred in asbestos mines and one in a stone quarry. The percentage of fatal accidents in mines is therefore 0.077; and in stone quarries and clay pits, 0.024.

Mr. Valiquette states that there has been a marked improvement in the methods of handling, using, and storing explosives, although attention is directed to carelessness in certain directions. Thus the methods of blasting in the asbestos mines is criticized on the grounds that the shot-lighters fire the holes after the morning shift without giving the miners sufficient time to get away. It is therefore advised that blasting be delayed for fifteen minutes after the end of the shift, and to ensure against misfires that an inspection of the holes be regularly made at not less that three-quarters of an hour after the shots have been fired.

THE CLAY AND SHALE DEPOSITS OF THE WESTERN PROVINCES.

The preliminary report of Messrs. Heinrich Ries and Joseph Keele on the clay and shale deposits of the Western Provinces, has just been issued by the Geological Survey of Canada as Memoir No. 24-E. It is a work of considerably over two hundred pages, profusely illustrated with photographs, maps and diagrams and is a valuable addition to the literature of the economic resources of the Dominion. The author's note that the results of their investigations, even though not detailed, have shown that the Western Provinces contain a wide variety of clays and shales adapted to the manufacture of firebrick, coke-oven brick, sewer pipe, fireproofing, paving brick, pressed and common brick, and drain tile. Many of these deposits, it is added, still remain undeveloped, but it is hoped that the present report will be the means of calling attention to them and of leading to their utilization. In this connection, it may be mentioned in passing that Dr. Heinrich Ries is admittedly the leading geological authority in America on clay deposits, and the survey is to be congratulated on having secured his services for the work in question.

The report is divided into ten chapters, of which the first six are devoted to descriptions of the clay and shale deposits inspected in the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia. Chapter VII deals with the clay-working industry, chapters VIII and IX with methods of testing clay and tests of brick; and chapter X with the origin and nature of clay. This last chapter is intended to serve as a guide to those who have no technical knowledge of the subject and is a most useful addition to the report.

Mr. C. A. Stewart, writing in the Mining and Scientific Press, calls attention to the resumption of operations in the South Belt at Rossland, and suggests that experience in the older mines of the district should be considered by those engaged in developing claims in this section. Exploration should, therefore, be undertaken with the expectation that lean stringers and bon-

anzas will alternate here as in the north; in fact, the value of the ore may be even more irregular than in the older mines, for the composition of the quartzite will vary from bed to bed, and may have an influence on the width and richness of the veins. The South Belt properties are about two miles south of the present producing mines, and include both prospects long idle and newly discovered croppings. They differ from the veins north of the town in having quartzite for wall-rock in several instances, and in containing galena with high silver content. These occurrences Mr. Stewart remarks present two geological problems : (1) The explanation of the presence of the galena, which is so much more abundant here than in the north, and (2) the probable effect of the quartzite on the permanence of the veins. He is not, he states, inclined to regard the galena as the result of any form of surface alteration, nor does he believe that its occurrence will be directly related to depth.

NATIONAL WASTE IN MINING.

At the annual meeting of the Royal Society of Queensland, the president, Mr. J. B. Henderson, Government analyst, took as the subject of his address that of "National Waste." In respect to waste in mining, he remarked that the history of many mining companies is a succession of managers, each of whom points out that his predecessor knew nothing of his business and straightway proceeds to demonstrate that he also does not know how to solve the problems. And so we have the capital that should have been applied to making the mine a wealth-producing business squandered in useless and often absurd methods. This statement although referable to Australasian conditions would apply with equal truth to conditions in other countries, of which Canada is no exception. Again, lying in many places over Australia, including Queensland, are huge heaps of ore residues, all waste products. They represent a very considerable monetary value, but for lack of a little knowledge—knowledge of a process by which these values should be economically extracted, these residues are at present waste. An example is given in the case of the Mount Morgan works, where over 600 tons of sulphuric acid is daily dissipated. This enormous sulphur loss, the speaker stated, is much more marked in America than it is in Australia, but the problem of its utilization is receiving close attention in the former. The waste in coal mining was also the subject of comment. First of all, with present mining methods, about one-third of the coal is left in the seams and can never be recovered. Of what is extracted that used in producing power by steam is mostly wasted—some of the waste being inherent to the methods, much of it due to unsuitable boiler construction, dirty tubes and plates and bad firing. It has been estimated that of the energy actually obtainable from the original coal in a coal seam less than ten per cent. is utilized by steam engines. With coal used for domestic purposes, probably less than 1 per cent. of the original energy of the coal seam is utilized. As a means of effecting a huge saving in this wasteful method of producing energy, the speaker advocated the establishment of large power stations in coal mining centres, where practicable, for the generation of electrical energy from waste coal and from waste gases from coke ovens. Electrical power generated on a large scale from such waste fuel would, it is estimated, be produced at a cost not exceeding 8 cents per unit; while the by-products from the distillation of the coal would also yield a return in ammonia, phenols, etc.

The time is unquestionably approaching when the titaniferous ores of both Quebec and Ontario will be marketable. Much experimenting with various alloys of steel has, of late, been carried on by rolling mill operators to produce a rail that will give more satisfactory service than the ordinary rail now in use. One of the principal metals used in these experiments is titanium, from which the best possible results have been obtained. In the United States last year over 250,000 long tons of rails were rolled from steel in which ferro-titanium had been added, and certain steel makers are now advertising titanium steel, which, it is claimed, is markedly superior in quality, especially as regards hardness, to high grade steels in which this alloy is not incorporated. So far as we are aware machinery manufacturers have not as yet experimented in this direction; but it would certainly appear that for machinery, subject to specially hard usage and wear, such, for example, as crushers, the employment of titanium-steel in the manufacture of parts, at least, would be decidedly advantageous.

The July issue of the American Mining Congress' Monthly Bulletin contains the text of a statement that has been sent to every United States senator, urging that the scope of the work of the United States Bureau of Mines be extended to include "the metal mines of the public land states." The circular intimates that the organization of mine safety work in the metal mining districts has not been entered upon, and is greatly needed, for "the loss of life in these districts is almost as great as in the coal mines." It is further pointed out that there has been a considerable decrease in the production of precious metals, from the Western States, and notably Colorado, in the last five years; and submitted that a solution of the problem of the economical treatment of low grade ores is the one method through which this great fundamental industry can be revived; that this problem is too formidable for private enterprise, and that when improvements are discovered by private effort the results are not made public. On these grounds the assistance of government is sought to engage in concentration experiments. To clinch the argument a comparison is made of conditions in the United States and those of Canada to indicate the relatively greater interest taken by the Canadian Government in the welfare of the mining industry. Thus it is shown that while the mineral production of the United States is nearly thirteen times that of Canada, the appropriation for mining and geological investigation in the United States, averaging about $18,000 per million population, is not quite three times that of Canada, whose appropriation in this regard represents about $88,000 per million population. To many, no doubt, this statement will come as a revelation. We have more to be thankful for than we knew.

It is claimed that the temporary reduction in cement duties has had the desired result of relieving the market situation, especially in the west. During June of this year the importations of cement represented 171,395, as compared with 55,646 barrels imported in June ,1910. The increase in importations in this month was, therefore, 115,750 barrels, or 208 per cent. Of this quantity, 107,000 barrels were imported by the Western provinces. It is stated, moreover, that Canadian manufacturers are more than maintaining the rate of production. Conse-

quently the measures taken by the Government would appear to have had a certain beneficial and no injurious effect as regards industrial conditions.

It is announced that arrangements have been made to extend the White Horse Pass and Yukon Railway, a distance of a hundred and twenty miles, from White Horse to Yukon Crossing, to open up the Tantalus coal fields. This may have an important effect in leading to the establishment of a smelting industry at White Horse, the copper ores from which district are at present consigned several hundred miles to the smelter at Tacoma, Washington, for treatment. Provided suitable fuel could be delivered at White Horse at a reasonable cost the main difficulty in the way of the local reduction of the White Horse ores would be removed. The Tantalus coals yield according to laboratory tests, a firm coherent coke, although somewhat high in ash.

The report of the Cape Asbestos Company for the year 1911 indicates that asbestos undertakings elsewhere than in Canada were affected last year by unsatisfactory industrial or rather market conditions, although perhaps to a less serious degree. The Cape Company was at least able to pay a dividend of 5 per cent. on its preference shares and to place a considerable sum to the credit of its reserve fund,—a very much better showing than was made by the majority of the Canadian concerns. The company has, meanwhile, established a new factory in Italy, and its future prospects would appear to be promising.

COMPANY NOTES.

International Nickel Company.—The report of this company for the year ending March 31st, shows net earnings of $5,019,703 by the constituent companies, and other income, $69,263. After deducting expenses and depreciation, there was available for dividends $3,581,960. A distribution was made of 6 per cent. on the preferred shares and 18 per cent. on the common, the sum of $903,799 being placed to reserve, which now represents $3,938,093.

QUEBEC NOTE.

It is reported that the Dominion Graphite Company at Buckingham, Que., has gone into liquidation. It is hoped, however, that the financial difficulties will be shortly overcome and that the company will be re-organized on a new basis.

SPECIAL CORRESPONDENCE

ONTARIO

COBALT, SOUTH LORRIAN

THE LIMIT.—The Ontario Government has thrown open 4,000 acres of the Gillies timber limit to prospectors. Ever since the first prospectors streamed into Cobalt in 1904, the limit has lain virgin and undisturbed in the very centre of the mining vortex. To the northwest of it is Coleman, the richest silver township on the continent; to the east is Lorrain township, at one time overrun with treasure seekers; to the south, South Lorrain. For years the limit was regarded as pregnant of possibilities as Alladin found the Cave of the Forty Thieves to be. There was not a Cobalt prospector that had not his fabulously rich vein covered up until such time as the limit should be thrown open, and if anything can revive the sinking industry of the prospector in Northern Ontario it will be this throwing open of the Gillies Limit.

In 1909, when the fervor of silver seeking had deserted Coleman for the Montreal River and Gowganda the Ontario Government held a sale of lots. The prices were very low at the first auction and but few of the twenty acre lots were sold. Two of the purchasers were J. H. Waldman, of Montreal, and a syndicate of Montreal business men, prominent among whom was Mr. Milton Hersey, of Montreal. Waldman found a most spectacular vein of silver on his property, and it was traced across the line on to what was afterwards known as the Wyandoh mine.

Waiting until the fame of these discoveries had time to spread, the Government held another sale and the lots went at bargain counter prices. The highest price paid for twenty acres was $35,000 by a Montreal syndicate, of which Mr. W. A. Fraser was a member, and there were many lots sold for over $25,000. The Ontario Government should have received, if all the payments had been made, between $400,000 and half a million dollars, and most of the money was paid. A thousand men were at one time employed prospecting on the limit, and on the Waldman, the Wyandoh and the Cleopatra expensive plants were enacted. Beyond the discoveries on the Waldman and the Wyandoh nothing of any importance was found and the veins on the former claims were found to be faulted.

To date the Gillies Limit, or as much of it as has been thrown open, is quite barren of profitable results. It was, therefore, less than justice for the Ontario Government to throw the remainder of the limit open to prospecting and staking in the ordinary way, as very remarkable ore bodies will have to be discovered to reimburse the public for the amount of money that has been paid to the Government for the privlege of prospecting and for the development that followed the purchase. A year ago so apathetic was the interest in non-producing Cobalts the privilege would have failed to draw many men from the Porcupine gold fields, but the silver camp has become fashionable once again and, no doubt, every claim will be taken up.

MOVES TO COBALT.—The Preston East Dome Mining Company has at length relinquished all hope of making good in Porcupine and has determined to use the remainder of the treasury in developing the Silver Bar property, which they have lately acquired. This property, which lies between the Savage property and the Gillies Limit was worked four years ago, and some rich ore taken out of a shaft sunk in the centre of the property where the conglomerate is shallow. The values were lost at the contact and nothing of importance has been discovered since and the mine has for years stood idle. Now it will be developed under the management of Mr. Stewart Thorne.

KERR LAKE CONTINUES.—The Kerr Lake Mining Company has declared its regular quarterly dividend for the third quarter of 1912. It is payable on September 16th. The disbursement amounts to $150,000 and the company has now paid a total of 139 per cent. or $4,-170,000.

T. H. & B.—The forty-first dividend of the Temiskaming and Hudsons Bay Mining Company was paid on July 30th at the usual rate of 300 per cent. This is the fifth dividend to be paid this year. The New Liskeard Mining Company has now returned to shareholders 21,100 per cent. on the issued capital, or $1,637,571.

MORE RESUSCITATION.—It is understood that the Cyril Lake Mining Company, which now owns the old Airgoid claim near the Nova Scotia, will begin work again soon. A shaft ninety feet deep has been sunk and it will be dewatered and sunk to the hundred-foot level before crosscutting is attempted.

PENN LEASE.—A considerable amount of success is attending the operations of the Penn Silver Mining Company at the Cobalt Central. A carload of ore, mined from the old workings, is ready for shipment and another carload is in sight. In addition to the stoping out of the old vein left by the old management, a considerable amount of development is being carried out.

THE ELK LAKE ROAD.—With the aid of a $6,000 grant the mine owners of Gowganda have patched up the road between Elk Lake and Gowganda. All bad spots have been corduroyed and the logs well covered. The first automobile, belonging to the Miller Lake-O'Brien mine, passed over the road last month without any serious mishap. The laying of steel on the Elk Lake branch from Earlton is making good progress and trains should be running before the first fall of snow.

PORCUPINE AND SWASTIKA

SWASTIKA.—There has been a recrudescence of activity in the Swastika section since the discovery on the Tough and Terry claims. The Tough claims have now been optioned to Mr. C. A. Foster, of Haileybury, and he has a few men on them doing some prospecting. It is understood that sampling on the small rich vein shows that some good assays can be obtained from the conglomerate as well as in the vein itself.

At Swastika itself the Lucky Cross is doing better. Two hundred feet west of the shaft a vein has been cut at the hundred-foot level, showing a good width of quartz and carrying good values. At the Swastika mine itself, reports are not so satisfactory, but excavations for the foundations of the small mill are proceeding rapidly.

PORCUPINE.—In Porcupine, the practice at the four mills running has given warrant for statements as to production which would have been thought far too optimistic some months ago. Both the principal mills of the camp are making such a close extraction that the amount lost will be negligible. The designers of the Dome Mill guaranteed an extraction of over 95 per cent., and the mill is now making a saving of nearer 98 per cent. After a series of disappointments with the tube mills, the whole mill is now running very smoothly and, during the month of August, will almost obtain a duty of ten tons per stamp, or 400 tons per day. The grade of ore, too, is highly satisfactory, being well over $10 per ton. Underground development is also proceeding apace. Connection between the raise to the mill tramway and the hundred-foot level will be made in a few weeks. The crosscut to connect the main shaft with that near the Golden Stairways vein is making good progress, but there is yet 200 feet to proceed.

While it is known locally that the Dome mill is producing satisfactorily, there can be no outward or visible sign of it until the company considers it expedient to allow it to be known what bullion is being produced and shipped. The same policy has been adopted at the Hollinger mill. At the Hollinger, after actual practice, it has been demonstrated that a saving of over 95 per cent. can be obtained with the aid either of amalgamation or concentration and it is, therefore, likely that both the tables and the pan-amalgamators will stand idle for some time at least.

THE McINTYRE FLOURISHES.—At the McIntyre the little ten-stamp mill is much more than paying the running expenses of the mine. The clean-up each week now amounts to over $5,000, though this amount has only been reached recently. In July the bullion from the mill realized $12,000, in August $14,500. Practice at the Hollinger has convinced the mangement that cyanidation will obtain better results than amalgamation and concentration and a plant has been ordered which will bring up the capacity of the mill to a hundred tons a day and upwards. At the Vipond about eighty-five tons a day are being crushed and when the tables can take care of it, the daily crushing can easily be raised to 100 and 125 tons per day. Both the Hollinger and the Vipond have made shipments, but no figures are available.

After prospecting the Hunter claims with the diamond drill the Porcupine Lake Mining Company has ordered a plant and it will be installed with all speed. The drilling of the property was very systematically undertaken and it is the general belief that the Hunter claims may prove that operations in the Township of Whitney are not altogether unprofitable.

Prospecting on the South Dome claims has shown a little ore and a pit is to be sunk to further develop the find. The claims are now owned by the Montreal syndicate that is meeting with success on the Dome Lake properties.

Work is still proceeding with vigor on the Dome Extension. A drift along the contact between the slate and the quartz porphyry has been pushed for 200 feet without much success so far. In another crosscut to locate the ore body to the east several stringers of quartz enriched with visible gold have been cut. Altogether 3,000 feet of underground development stand to the credit of the company.

BRITISH COLUMBIA

On July 25th there was shipped from the Granby Consolidated Company's mines at Phoenix, Boundary district, the large quantity of 4,500 tons of ore, which was hauled over the railway lines of the Canadian Pacific and Great Northern Companies, both of which have branch lines connecting with the Granby smeltery at Grand Forks. While it is not known to the writer of these notes whether or not this quantity constitutes a record for a single day's ore shipments from these mines, it is quite probable it does.

LARGE OUTPUT OF BOUNDARY MINES.—Recently the output of ore from the Granby Company's

mines at Phoenix reached an aggregate of 8,000,000 tons, all of which was smelted at the company's works at Grand Forks. While exact figures of the total quantity of foreign ores, also smelted there, and the quantities of all metals produced to date, are not just now available, a rough estimate may be made, as follows: Total quantity of foreign ore treated to date, say 250,000 tons. All metals produced, that is, from the abovementioned 8,250,000 tons of ore, say: Gold, 456,000 oz.; silver, 3,150,000 oz.; and copper, 190,000,000 lbs. Although this is given as a rough estimate, it is evident it is a reasonable one, for the company's published figures to the end of its fiscal year to June 30th, 1910, were as under:

Granby mines ore smelted	6,263,091 tons.
Foreign ores smelted	214,544 tons.
Foreign matte smelted.......	13,514 tons.
Metals produced from ores, etc., as above:	
Gold	389,589 oz.
Silver	2,589,213 oz.
Copper	161,168,537 lb.

A very approximate valuation (gross) of these metals gives an aggregate of $40,000,000. It may be that if value were calculated at the exact average prices of the several metals year by year a greater amount, or possibly a smaller sum total, would be arrived at. Without any claim to reliability for the aggregate sum given above, it seems quite reasonable to assume that, for general purposes, it may be said the gross value of the metals produced by the Granby Company is about $40,000,000, this including, as well, the value of metals recovered from foreign ores. But the before-mentioned total sum by no means represents the whole of the value of the output of Boundary district mines, for there are several others to be taken into account. Of these, though, the British Columbia Copper Company's Mother Lode mine is the only one the production of which will be stated here. The aggregate output of that mine to date may be placed at about 2,500,000 tons of ore, having a gross of $8,000,000 to $9,000,000.

If to the value of ore from the mines of the Granby and British Columbia Copper Companies be added that of the Snowshoe, the several mines in Phoenix camp of the New Dominion Copper Company, and those in Summit camp that were also producers, not to say anything of numbers of shippers of comparatively small quantities of ore, it would appear to be quite reasonable to claim for the whole Boundary district, east of the Okanagan, an aggregate output of a gross value of well on toward $60,000,000.

Bearing in mind that Boundary mines are still producing large quantities of ore — it is estimated that in the Granby mines alone there still remains about 5,000,000 tons of developed ore—it will not be surprising to find that eventually an aggregate gross value of $100,000,000, as the output of that district, will be reached.

SOUTH BELT, ROSSLAND CAMP.—Several mining properties, situated in what is known as the South Belt of Rossland camp, are again being worked, these including the Blue Bird, Richmond group, Lily May, and Phoenix. The Curlew shaft was recently unwatered for examination preliminary to determining what further development shall be done.

Of the before-mentioned properties, the Blue Bird was, until a few weeks ago, the only one from which ore had been shipped in quantity. To date, seventeen carloads, containing some 400 to 500 tons, have been shipped to the smeltery at Trail during the period Mr. Lyman Carter has been manager of the mine. When the property was visited on August 2nd, the eighteenth car was being loaded. For the last year or two lack of funds had prevented the owners from providing sufficient power equipment to admit of needed development work being done. This difficulty was recently overcome by the organization of the Rosalia Mining Company, Limited. Now, there is a small but efficient power plant, and the shaft is being sunk from the 200 to the 300-foot level. This plant comprises two vertical steam boilers, together 50 h.p.; a Canadian Rand Company's four-drill compressor and an air receiver; a double-cylinder hoist; pump; two machine drills, etc. A crosscut tunnel connects with the shaft at the 94-foot level, improving ventilation and facilitating disposal of the water by the steam pump. There are five veins on the property, and the shaft has been sunk on the middle one, which has also been opened by a drift, 70 feet in length, extending westward on the 94-foot level. It is intended to crosscut south to cut another vein on the same level.

Besides the Curlew, already mentioned, there are other properties in the near vicinity of the Blue Bird, among them the Homestake and Mayflower, but both are unworked at the present time. About a mile to westward are the Lily May, Hattie Brown, Richmond, and other mineral claims, these having been acquired by the Richmond Consolidated Mines, Ltd., of which Mr. J. L. Warner is manager. It is stated that there are on this group of claims five well-defined veins—three having an easterly and westerly and two a northerly and southerly course. In the ore of the former, silver and lead are the chief metals; that of the latter contains gold and copper. During several recent months much exploratory work has been done near the surface, and it is stated that some showings of gold ore have been uncovered. Quite lately the Lily May, which was the first claim located in Rossland camp, dating back to 1889, was added to the Richmond group, and as there is on it a shaft of a depth of 200 ft. or more, it is intended to put in machinery and work the property from this shaft. On the occasion of the valedictory banquet given to Mr. J. S. C. Fraser on July 30, Mr. J. L. Warner, who for some time past has given much attention to the South Belt, said, in part: "As a result of exploratory operations for some months in the South Belt, I have become convinced that we are working in formations identical in character to those of Red mountain, on which are situated the Le Roi, Centre Star-War Eagle group, Josie and other well-known productive mines. The same dikes cross the series of parallel veins in both North and South Belts, but the greater depth of decomposed surface rock in the latter makes exploration of veins on the surface more difficult. New places show gold-copper ore, but this class of ore, which is similar to that occurring in the North Belt, is being exposed in proximity to the strongest dikes. There exists evidence for my opinion that the prevailing galena ores —a type of vein-filling with the associated volatile metals, arsenic, antimony and zinc, in the iron croppings of the South Belt veins) are but the emanations from the deeper ore bodies of gold-copper pyrrhotite ore. One indication of their origin is seen in the changing character of ore in all east and west veins near their junctions with the prominent dikes. I can express my absolute confidence that all the South Belt needs to disclose large ore bodies, of the same character of gold-copper

ore as the North Belt is now producing, is deep development."

The Phœnix claim, situated only a short distance from one of the residential parts of the town of Rossland, has lately been attracting much notice locally. Years ago three prospecting shafts were sunk on this property, to respective depths of 80, 36 and 30 ft., and assay returns as high as $40 per ton in gold were obtained from samples of the ore. Water was troublesome, however, so when Mr. M. Trewhella determined upon exploration work higher up the hill, under his two years' lease of the property, he appeared to have adopted a wise course, for he has discovered a vein not previously developed and has made several openings on this. When visited recently it was seen that there was about two feet of good-looking gold-copper ore in the bottom of a prospecting shaft then only 18 ft. in depth. Some 30 tons of ore has been shipped to Trail, and more is being taken out for shipment. The Phœnix certainly looks to be a promising claim, the ore being of a similar character to much shipped from the Le Roi and other mines on Red mountain, so the lessee is much encouraged to proceed with development to a fair depth.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Cobalt Aug. 10.

Ore shipments this week are nearly double those of last week with the high-grade predominating by five cars to one of low grade. Nine mines sent out 19 cars, with the Coniagas leading with seven cars of high grade.

Only two mines sent out bullion during the week, but the totals are large, considering the few shippers in this grade.

Bullion shipments were as follows:

	Ounces.	Value.
O'Brien	1,936.61	$1,113.77
Nipissing	45,263.00	27,158.34

The shipments of ore total twice that of last week, the feature being the total of 16 cars of high-grade to three of low grade. There are the same number of shipping mines in the list with the amount shipped far in excess of last week.

Ore shipments are:

	Cars.	Grade.	Pounds.
Coniagas	7 h	..	415,879
Nipissing	...	31	227,652
McKinley	2 h	..	137,036
La Rose	2 h	..	169,552
Buffalo	1 h	..	63,000
Trethewey	1 h	..	53,700
Cobalt Lake	1 h	..	65,700
Townsite	1 h	..	61,000
Timiskaming	1 h	..	63,704
Totals	16 h	31	1,262,220

The bullion shipments from the camp to date for the present year are: 2,951,604.14 ounces, valued at $1,735,407.39.

The Cobalt ore shipments for the year to date are 25,286,917 lbs.

B. C. ORE SHIPMENTS.

Week ending August 3rd.

Boundary.

	Week.	Year.
Granby	25,602	729,209
Mother Lode	6,892	220,396
Napoleon	390	4,014
Rawhide	5,507	126,217
Lone Star	664	2,022
Unnamed	315	6,920
Surprise	153	2,790
Nickle Plate, milled	1,500	45,000
Other mines	....	17,559
Total	41,023	1,154,127

Nelson.

Queen, milled	300	7,200
Mother Lode, milled	350	3,100
Molly Gibson, milled	300	3,000
Granite-Poorman, milled	250	8,000
Molly Gibson	81	30
Hudson Bay	30	30
Queen	28	352
Other mines	....	8,851
Total	1,339	32,060

East Kootenay.

Sullivan	715	18,967
Monarch	84	609
Monarch, milled	425	4,850
Other mines	....	6,625
Total	1,224	31,051

Slocan and Ainsworth.

Bluebell, milled	175	625
Standard, milled	400	10,000
Van Roi, milled	1,100	36,100
Whitewater	136	179
Standard	136	5,163
Bluebell	99	99
Rambler-Cariboo	33	777
Richmond-Eureka	31	823
Rio	31	31
Other mines	....	6,673
Total	2,141	60,470

Rossland.

Centre Star	3,155	93,402
Le Roi	846	28,136
Le Roi No. 2	212	16,157
Nickle Plate	28	28
Le Roi No. 2, milled	300	4,100
Total	4,541	141,823

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	25,602	729,209

B. C. Copper Co.'s Receipts.

Grand Forks, B.C.

Mother Lode	6,892	220,396
Napoleon	390	4,014
Rawhide	5,507	126,217
Lone Star	664	2,022
Unnamed	315	6,920
Other mines	....	14,784
Total	13,768	374,353

Consolidated Co.'s Receipts.

Trail, B.C.

Centre Star	3,155	93,402
Le Roi	846	28,136
Sullivan	715	18,967
Le Roi No. 2	212	16,157
Surprise	153	2,790
Whitewater	136	179
Standard	136	5,163
Bluebell	99	99
Monarch	84	609
Molly Gibson	81	1,537
Rambler-Cariboo	33	777
Richmond-Eureka	31	823
Rio	31	31
Hudson Bay	30	30
Nickle Plate	28	28
Queen	28	352
Other mines	....	9,689
Total	5,798	178,769

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

August 12th, 1912.

New York Curb.

	Bid	Ask
Braden	6.75	7.25
B. C. Copper	5.25	5.50
Butte Coal	....	....
Giroux	5.00	5.12½
Green Cananea	9.87½	10.12½
Inspiration	19.00	19.12½
Yukon Gold	3.62½	3.75
Goldfield Con.	3.75	3.87½
Nevada Hills	2.00	2.06¼
Miami	29.50	29.75
Tonopah Mining	6.87½	7.12½
Ray Con.	20.75	21.00
Chino	34.75	34.87½
United Copper	.50	1.00

Cobalt Stocks.

	Bid	Ask
Bailey	2¾	3
Beaver Consolidated	44½	45
Buffalo	140	150
Chambers-Ferland	20½	21
City of Cobalt	22½	23½
Cobalt Lake	28¾	29¼
Coniagas	730	775
Crown Reserve	330	345
Great Northern	7	8
Gould Con.	..	..
Gifford	3½	4½
Green Meehan	1	1⅛
Foster	15	20
Hargraves	..	5¼
Kerr Lake	270	295
La Rose	305	315
McKinley-Darragh	178	179
Nipissing	770	795
Ophir	7	10
Otisse	1¼	1½
Peterson Lake	7¼	8
Rochester	2½	3
Right of Way	5½	6
Silver Leaf	3¾	4½
Silver Queen	3	6
Temiskaming	37	38
Tretheway	40	46
Wettlaufer	43	46

Porcupine Stocks.

	Bid	Ask
Apex	2¼	3
Dobie	20	35
Crown Charter	8¾	9
Dome Ext.	14¼	15
Eldorado	..	..
Foley-O'Brien	18	22
Hollinger	1245	1265
Jupiter	27	27¼
N. Ont. Exp.	200	250
Pearl Lake	18	19
Porcupine Imperial	2	2½
Porcupine Tisdale	1½	2
Moneta	5	7
Preston East Dome	3¼	4
Rea Mines	25	35
Swastika	9	9¼
Standard	..	1
Vipond	28	28¾
United Porc.	1	2
West Dome	10	20

Sundry.

	Bid	Ask
American Marconi	725	750
Canadian Marconi	500	502½
Island smelters	3	4

SILVER PRICES.

	New York cents.	London pence.
July 20	60½	27⅞
" 22	60¾	27 15/16
" 23	60¾	27 15/16
" 24	60⅝	27⅞
" 25	60⅝	27⅞
" 26	60⅝	27⅞
" 27	60½	27 13/16
" 29	60½	27 13/16
" 30	60	27⅝
" 31	60¼	27¾
Aug. 1	59⅞	27 9/16
" 2	60	27⅝
" 3	59⅞	27 9/16
" 5	59⅞	....
" 6	60	27⅝
" 7	60⅛	27 11/16

MONTHLY AVERAGES, 1912.

January	56.260
February	59.043
March	58.375
April	59.207
May	60.880
June	61.290
July	60.654

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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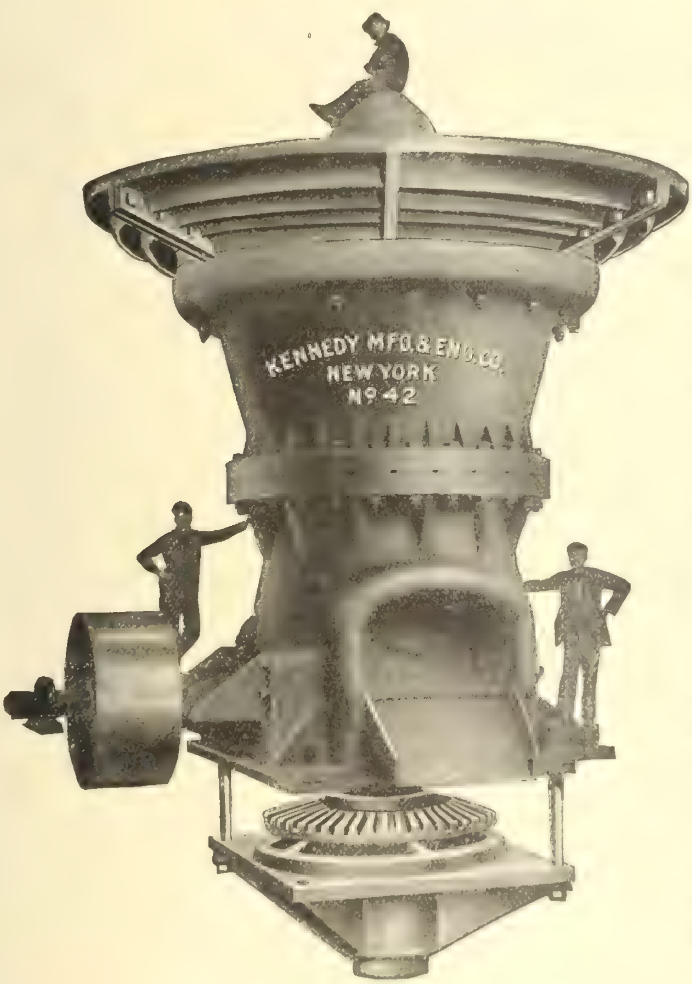
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NEW YORK
Nº 42

PROVINCE OF QUEBEC

Department of Colonization, Mines, and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, Etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $10 an acre for SUPERIOR METALS when more than 20 miles distant from a railway and $20 an acre when less than 20 miles.

For INFERIOR METALS the prices are $2.00 and $4.00 an acre respectively.

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

THE HONORABLE THE MINISTER OF COLONIZATION, MINES, AND FISHERIES, QUEBEC.

Nova Scotia Mines

Gold, Coal, Iron, Copper, Lead, Tin, Manganese, Tungsten, and other minerals.

The Gold District covers more than three thousand square miles. Millions of dollars worth of gold have been taken from the gold fields of Nova Scotia and millions of dollars worth remain for recovery.

Gold mining in this Province offers good inducement for investment. Labor is cheap and plentiful: timber and fuel are abundant.

Large deposits of iron also are known to exist at various places in the Province; and considerable mining has been done in connection with this mineral, the ore being used locally and shipped to foreign ports.

Among the most important minerals occurring in economic quantities may be mentioned: Coal, Gold, Silver, Manganese, Leadsilver, Copper, Barytes, Mineral Pigments, Gypsum, and Tungsten.

Licenses are isued for prospecting for Gold and Silver for a term of twelve months.

The licenses are for areas 150 by 250 feet, and can be obtained for 50c. an area.

Leases can be secured for $2 an area, for a term of forty years; subject to annual rental of 50c. an area.

Licenses to search over five square miles, for a period of eighteen months, for minerals other than gold and silver, cost $30.

Leases for three renewable terms of twenty years each can be obtained for $50, and are subject to a yearly rental of $30.

Royalties are as follows:—

Gold, two per cent. on the gross value thereof; Copper, four cents a unit; Lead, two cents a unit; Iron, five cents a ton; Tin and Precious Stones, five per cent.; ten cents on every long ton sold or removed from the mine.

Copies of the mining law can be had gratis, by applying to the Department of Public Works and Mines, Halifax, Nova Scotia, or to Mr. John Howard, Agent General for Nova Scotia, 57a Pall Mall, London, England.

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Mussens, Limited.

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S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

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Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

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Mussens, Limited.

Drills, Air and Hammer—
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Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Canadian Rand Co.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

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American Diamond Rock Drills.
Sullivan Machinery Co.

Drill Steel Sharpeners—
Canadian Ingersoll-Rand Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.
Canadian Ingersoll-Rand Co.

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Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

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Can. Fairbanks-Morse Co.
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Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

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Peacock Bros.

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M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian Iron Co.
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Jenckes Machine Co.
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Mussens, Limited.
S. Flory Mfg. Co.
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Peacock Bros.
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Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
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Peacock Bros.
E. Leonard & Sons.
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Jenckes Machine Co.
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Fraser & Chalmers, Ltd.
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Jeffrey Mfg. Co.

Generators—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

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B. Greenings Wire Co., Ltd.
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Can. Fairbanks-Morse Co.
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John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
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Chalmers & Williams.
Fraser & Chalmers, Ltd.

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Jenckes Machine Co.
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Peacock Bros.
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Jenckes Machine Co.
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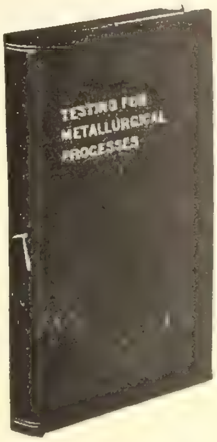

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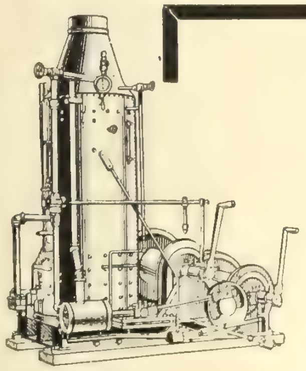

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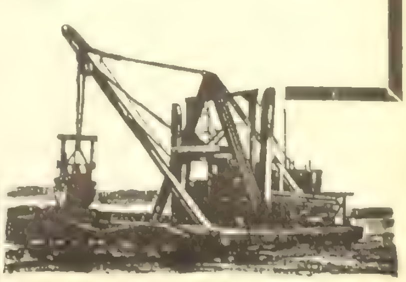

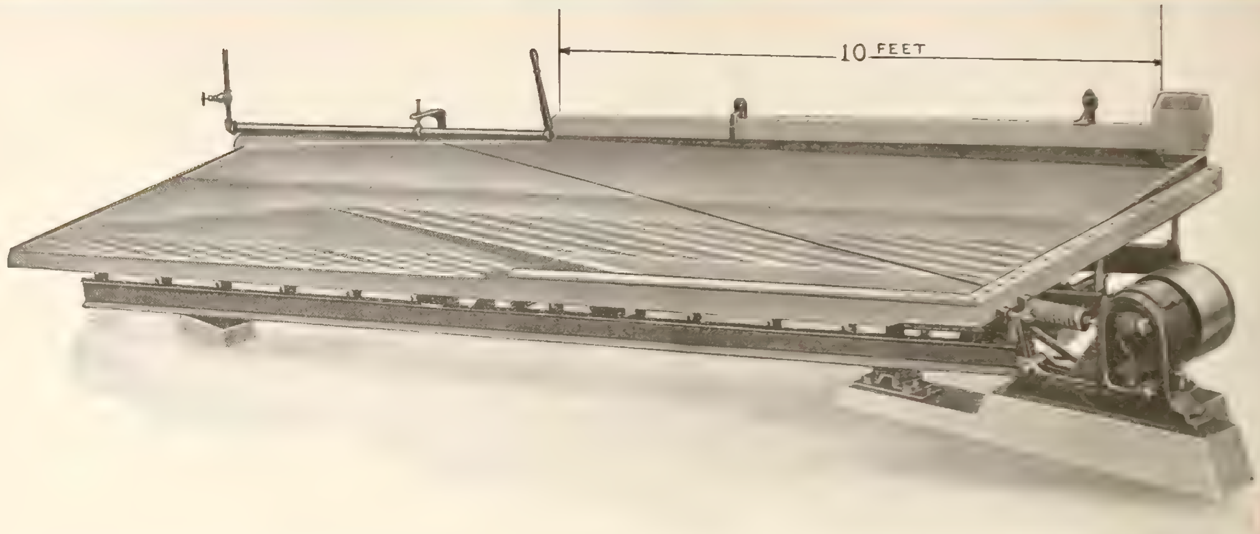

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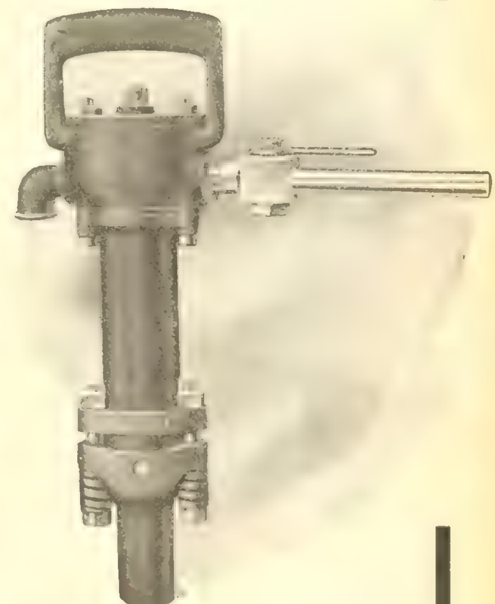

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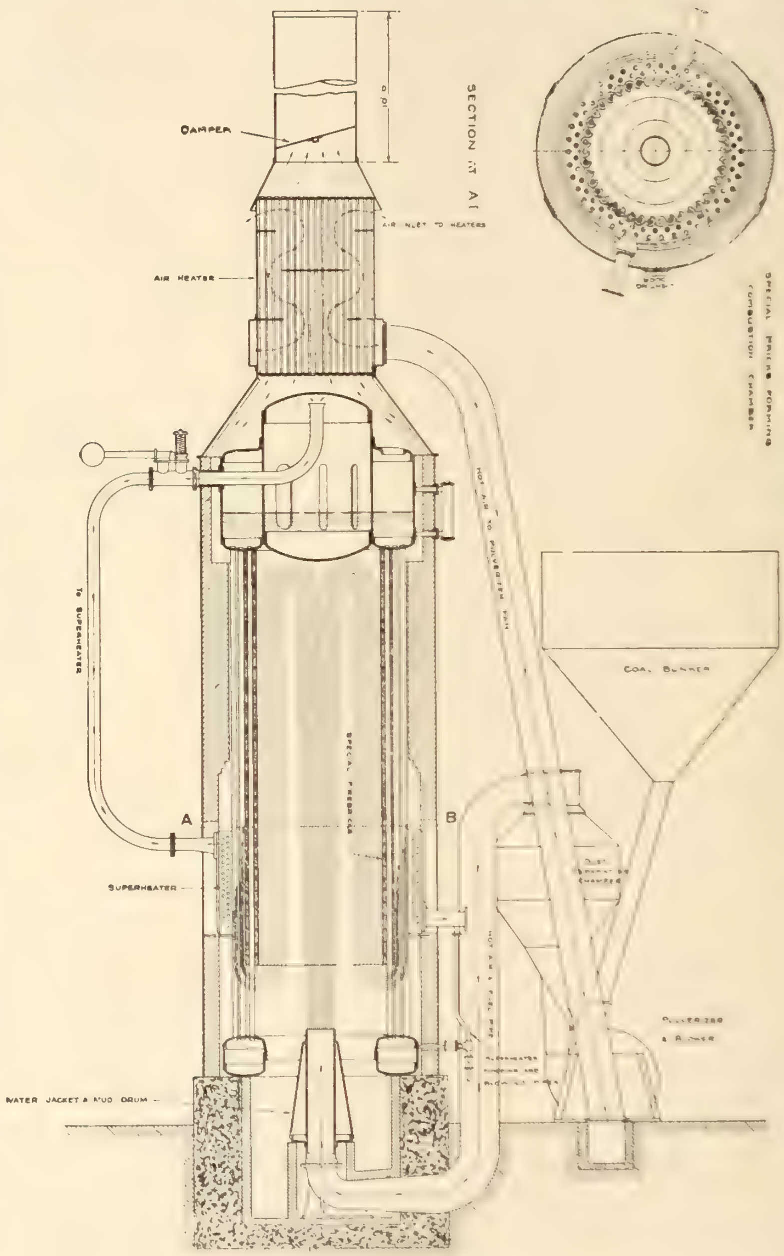

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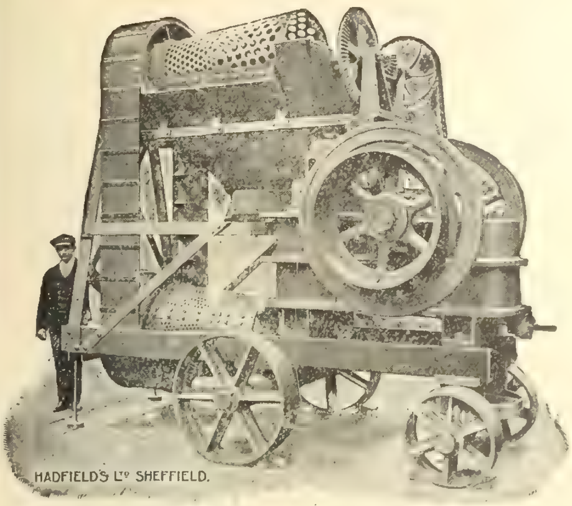

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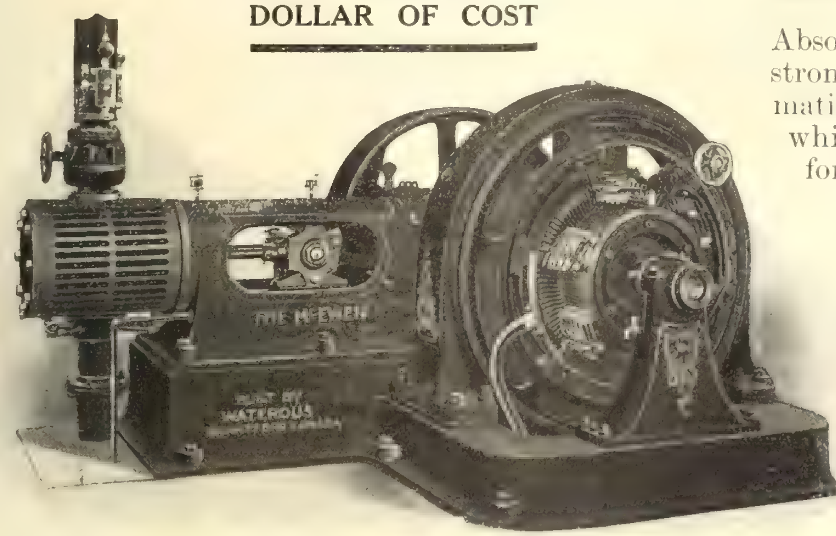

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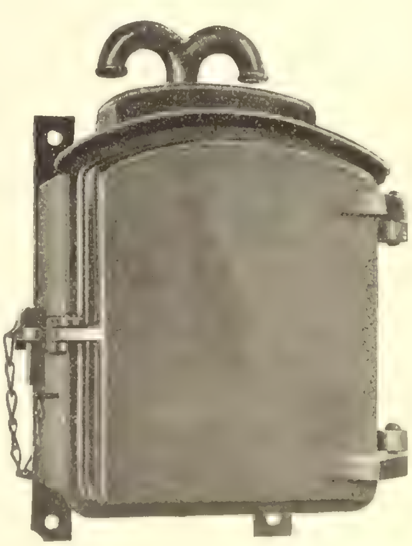

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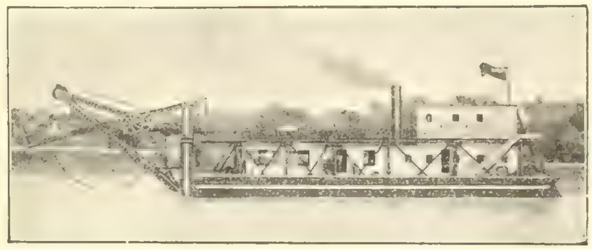

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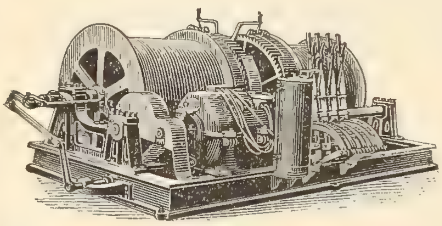

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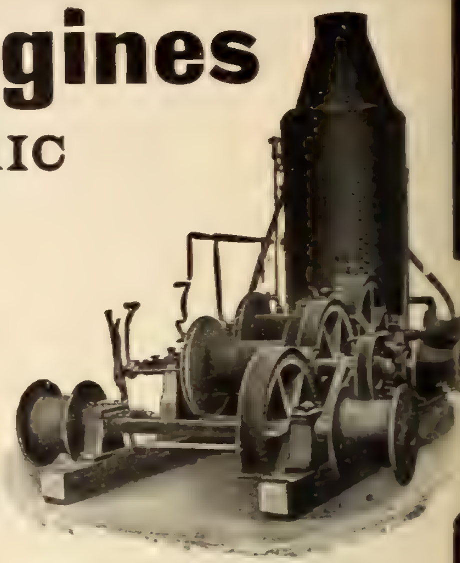

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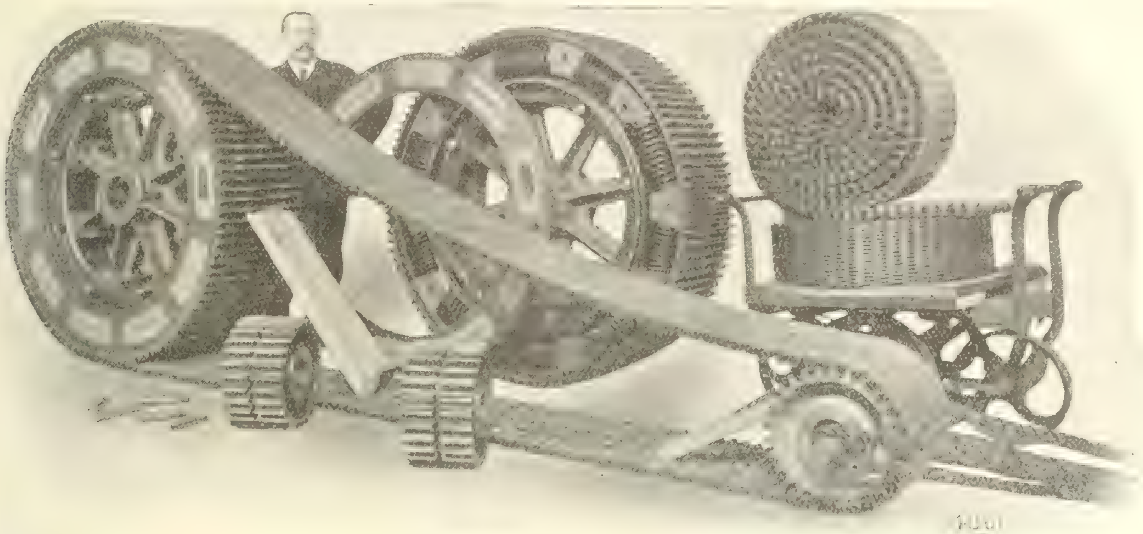

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THE CANADIAN MINING JOURNAL

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CONTENTS.

THE INDUSTRIAL EMPIRES OF THE PACIFIC.

The greatest of national assets are coal and iron. It is these that are mainly conducive to industrial supremacy. England, Lord Ramsey asserts, will have exhausted her coal supplies in two hundred years, calculating on the present rate of production alone. Without coal England would ont only cease to be the greatest manufacturing country in the world, but she would be out of the race altogether. Much may, however, happen in two hundred years and the problem and its solution will concern more immediately succeeding generations. Long before, however, any such catastrophe can occur from the cause mentioned, the whole trade conditions of the world may be changed by events now developing. Among these are the building of the Panama Canal and, more momentous still, the awakening of China. In a paper on the subject of "International Coal Competition," contributed recently to the Canadian Mining Institute, Mr. Allan Greenwell, editor of The Colliery Guardian, it was shown that if the natural course of trade is allowed free play, a country will inevitably produce for itself and for other countries that in which it has the greatest relative advantage (or least disadvantage). If this product be coal, it will tend towards monopolizing the production of coal, and to causing the countries which previously produced it to direct their labour and capital towards the production of something else in which they have an advantage. Again, "the value of a commodity is a matter of supply and demand; so if a country possesses an unlimited supply and can export cheaply a commodity for which there is a considerable demand, it may be said to be on the high road to commercial prosperity." It is a fundamental law that a coal-driven industry tends to follow the fuel, and not the fuel the industry. Thus a country possessing an unlimited supply of cheap coal can send out its surplus coal to fetch raw material, which it manufactures cheaply by means of its cheap coal, markets the surplus and accumulates wealth. The building of the Panama Canal will reduce substantially the cost on the carriage of raw materials to the Canadian west. It will also considerably enlarge the available markets for our Western coals. By the first, manufacturing may become possible; by the second, a large surplus may be profitably mined for export. Mr. Greenwell sees no reason why the enormous coal resources of British Columbia and Alberta should not, "when the time arrives," be developed to an equal extent with those of the United States. The time is rapidly approaching. He, meanwhile, quotes Jevons to prove that it is a commercial impossibility for any country to se-

cure or maintain a manufacturing supremacy on coal drawn from far distant fields, and the manifest corollary to this conclusion is that there can be no real or lasting inducement to a country to develop its coal supplies in order to foster a manufacturing industry in another country, especially if it can organize such an industry itself. Eventually, as Mr. Greenwell states, competitive manufacturing industries must be carried on in the neighbourhood of the coal supplies, and the surplus production of the latter employed for navigation purposes in fetching the raw materials, and in distributing the manufactures.

The coal resources of the Canadian West are, therefore, destined to become one of the chief factors in the creation of new industrial domination on the Pacific. Such development will be of prodigious advantage to the British Empire. On the other hand we can regard with less complacency the imminence of a competition that within the present century will at any rate make itself felt in the markets of the world, and may eventually be revolutionary in its effects, causing the pendulum of trade to swing in entirely different directions to that of to-day. According to Mr. Thomas T. Read, formerly Professor of Metallurgy at the Imperial Pei-Yang University, at Tientsin, China not only possesses enormous resources in iron, but her coal resources in point of quantity are comparable with those of the United States, while in quality they are in general of higher grade. Thus the amount of lignite is comparatively small, and the proportion of anthracite to bituminous is relatively larger than in the United States. The present production of coal in China is not much greater than that of Canada (about fifteen million tons annually); the iron production is approximately 0.5 lb. per capita per annum as compared with a per capita production in the United States of 600 lb. per annum. But China is awakening. Her people are as imitative, if not quite as adaptable as the Japanese. They are infinitely more industrious, more conscientious, more painstaking. Like the Japanese, the Chinese are now sending students to acquire the knowledge and methods and sciences of Western civilization. In less than a quarter of a century Japan remodelled her entire industrial and social systems. The change from feudalism to modern conditions of life represents in European countries an evolution covering five hundred years. In the first test of strength between East and West, the former was signally victorious. That the equilibrium of trade has been less disturbed than it has by the introduction of the factor of Japanese competition is due to two causes, the natural resources of the country in coal and iron are relatively unimportant, and the labour while cheap is of low efficiency. The development of China will, no doubt, take longer; but when the day arrives when she has mastered the secrets of the West, when she turns to account her natural wealth,—resources that, lying dormant through the centuries, have been thus conserved while those of European nations have been largely drawn upon,—when she competes for the trade of the world and brings to bear therewith that shrewdness and untiring patient industry and skill that are racial characteristics, then, indeed, will the white race have difficulty in maintaining its own.

THE MINING INDUSTRY AND THE DOMINION GOVERNMENT.

It is now nearly ten years since the Canadian Mining Institute first urged the Dominion Government to create a Portfolio of Mines in order that this important industry might be adequately represented both in the Cabinet and in Parliament. Some time passed before any steps were taken by the administration then in power to comply with the wishes of the mining interests in this regard; but ultimately a sort of compromise arrangement was made by which the Portfolio was created, although the minister to whom it was entrusted was given a dual office, being minister both of mines and of inland revenue. The administrative duties in connection with the Department of Inland Revenue are, however, relatively light and, while there is, of course, no possible correlation between the functions of work of the two departments, the arrangement proved tolerably satisfactory. The Minister was, at least, able to devote a considerable portion of his time to a consideration of the requirements of the mining industry; he came in direct touch with the mining interests, and he was in a position to represent the views and needs of the industry both in Council and in Parliament. With the change of government last year, however, the Portfolio of Mines was to all intents and purposes abolished. It was at first, as before, tacked on to the Department of Inland Revenue; but the Minister in charge of this department, unlike his predecessor, was entirely ignorant of mining conditions and we are inclined to believe, temperamentally unfitted to undertake the administration of a department that, perhaps, more than any other at the present time, requires firm and, at the same time, sympathetic and tactful guidance. This was apparently recognized, for a few months later a change was made and the Department of Mines was disassociated from that of Inland Revenue, and attached to the Department of the Interior. As a temporary expedient the move was, no doubt, justified; but so far as cabinet representation is concerned the mining industry is now in exactly the same position as it was ten years ago. In fact, it is in a worse position, for the administration of the Department of the Interior to-day is a proportionately weightier matter than it was ten years ago, and no minister, however able, could be expected to assume additional responsibilities, nor should he be saddled with them. Already the Department of the Interior is sub-divided into four or more branches, including immigration, lands, Indian affairs and forestry. It is no uncommon thing for a deputy minister of one of these divisions to wait sev-

eral days before he is given an opportunity of interviewing the minister on some question of importance, and one perhaps demanding prompt action. True, the pressure will be, in a very large measure, removed when the new Provinces of Alberta and Saskatchewan are ceded control of their natural resources; but even then there will be ample to occupy the attention of the minister without adding to his duties. The national importance of our mining industry warrants, more it demands, the establishment of a separate and distinct depatrment of mines, under the direction of a Minister who can devote his entire entire energies to ensuring its efficiency. The lack of proper orgainzation in this department has been a subject of comment for years past. In spite of the fact that an Act establishing the department has been acually passed, conditions at the present time are very nearly as chaotic as at the worst time in the history of the Geological Survey. This is no reflection on individuals. In general, the officials of both the Geological Survey and Mines Branch are able and keen; it is the organization, the system that is defective. So long, therefore, as the fundamental defect is not remedied will the present conditions obtain. The present administration has a great opportunity to render a notable service to the country by the establishment of a Federal Department of Mines on a sound and certain basis.

Elsewhere we print, in part, the text of a memorandum on this subject prepared by the Secretary of the Canadian Mining Institute at the direction of the Council and submitted to the Prime Minister.

THE MINES' REPORTS OF BRITISH COLUMBIA AND QUEBEC.

The efficiency of the public service in Canada as regards the publication of useful information in respect of the mining industries has long been recognized. The reports of the Geological Survey and, more recently of the Dominion Mines' Branch, compare advantageously with publications of a like nature of any country in the world. In none is more attention given to the consideration of questions of economic significance; and our Government literature on mining and geology is, therefore, alike esteemed by the scientific and the industrialist. No less commendable are the annual reports of the Provincial Bureaus, notably those of British Columbia, Qnebec and Ontario. In our last issue attention was directed to the eminent presentableness of the British Columbia report. The enconium of our reviewer we heartily endorse. But the British Columbia report has an established reputation; for many years past it has held the palm for typographical excellence. It has been and is still, though in a minor degree, open to criticism in the one respect only, that it includes statements by mining recorders and other non-technical officials, whose information is largely based on hearsay. The practice is dangerous and this feature of the report might be advantageously eliminated in future. It is less pronounced this year than formerly. The valuable features of the British Columbia report have always been the contributions of the Provincial Mineralogist, Mr. W. Fleet Robertson, whose inability to call a spade anything but a spade, and not an agricultural implement, did not conduce to his popularity with a certain class in earlier "boom" times. Now his sterling and manly qualities are generally appreciated at their proper worth. But surely in a province in which the mineral industry has assumed the importance and proportions of that of British Columbia, a province, moreover, in which the industry has such immense potentialities, the entire responsibility of the technical field work of the department should not devolve on one official alone. Mr. Robertson has done yeoman's service practically unassisted; but he can not be expected to achieve the impossible, nor is it wise to attempt to overwork the willing horse. With an adequate staff of assistants the Provincial Mineralogist of British Columbia would be in a position to vastly increase the efficiency of his department, and never was the time more opportune than the present. The investing public has begun to forget the after taste of the Rossland "boom"; the industry in general has been rehabilitated, and the outlook to-day is more favourable than for years past; and last, but not least, an enormous area of new territory will ere long be rendered readily accessible to the prospector by the completion of the numerous lines of railway now in course of construction. There should, therefore, be a revival of interest, which the publication of special reports by the Provincial Bureau of Mines, on the newer districts, would certainly stimulate. It is true the Provincial Mineralogist has had the assistance of Mr. Herbert Carmichael, formerly the Provincial Assayer, in the reporting on mining areas; but Mr. Carmichael is an expert chemist rather than a mining engineer or geologist, and in any event is not now prepared to devote the major portion of his time to the Government service. Again, it may be urged that since the Geological Survey devotes more attention to British Columbia than to any other province—a discrimination that may be open to criticism—it relieves the Provincial Department of certain obligations. Neither the Provinces of Ontario or Quebec, however, has taken that view; and since the British Columbia treasury derives a very considerable revenue from the mines of the province, it is but fitting that a reasonable expenditure should be made in the direction indicated.

In striking contrast to the British Columbia policy is that recently adopted by the Quebec Department of Mines. The Quebec report for 1911 has been distributed during the present month (July). The Quebec report a few years ago was not a publication of which the Department or anyone else could be proud. It was poor inside and out; but the officials responsible escape censure because no one can blame a man who fails to

make good bricks without straw. With the appointment of Mr. Theo. Denis some two years or more ago, wa scommenced a new regime. The department ceased to be apathetic, content merely to remain in the rut of routine, but instead set the pace for the other mining bureaus of the Dominion to follow. The Quebec report for 1911 in typographical appearance and general presentability closely rivals the British Columbia report; as regards the quality of its contents it compares favourably with any Government mining report yet published in the country. During the summer months of 1910 and 1911, and again this year, the programme the Department has mapped, qualified engineers and geologists have been sent into the field to ascertain the possibilities of mining expansion in unexplored territory. So far, unhappily, the results have been largely negative. But negative results have also value. Dr. Barlow's report on the Chibougamau region saved both the Government and private undertakings much useless expenditure; Dr. Bancroft's report on Keekeek District was equally effectual in preventing vain effort and possibly in squelching the aspirations of certain promoters. On the other hand Prof. Dulieux's investigations of the magnetic sands, the titaniferous and other iron deposits of the province promise to have a direct economic value. But whether immediately or otherwise, the energetic and commendable course adopted by the Quebec Department of Mines to facilitate the development of the mineral industry of the Province will bear fruit.

EDITORIAL NOTES.

The English consul at Dairen reports that an asbestos deposit, of an estimated area of about 340 acres, was discovered last year at the foot of Mount Sansom, near Chinchow, and operations were commenced at the beginning of this year. The asbestos obtained is said to be of good quality. It is white or reddish-brown in colour, some of the fibre being over 2½ inches in length.

In a paper read at the annual meeting of the German Chemists' Association at Freiberg, Dr. Bergius, of Hanover, gave an interesting description of experiments conducted by himself to produce coal from its original substances in the laboratory. In a specially constructed apparatus, allowing the application of great pressure at high temperature, he heated either cellulose or peat with water to about 340 degs. under a pressure of more than 100 atmospheres, in each case the two materials being transformed into a product which, according to chemical analysis, was indentical with natural coal. At a temperature of 310 degrees the process required 64 hours for its completion; at 340 degrees it occupied no more than 8 hours, the speed of the reaction doubling for every increase of the temperature by 10 degrees. Upon this basis Dr. Bergius calculated that the peroid of natural coal formation at the temperature of the earth's crust would be about 8,000,000 years—a figure that approximately agrees with the periods established by geologists.

A capital story is related by The Financier (London), of a syndicate, with a capital of £2.000, which, having been formed to acquire options in Nigeria, despatched an engineer to inspect a property it had obtained the right to purchase. Within a few weeks of his arrival, the following cable was received: "Property absolutely valueless. Coming home." As may be imagined, this caused considerable disgust, but the chagrin soon changed to joy when a further cable was received, announcing that the engineer had been eaten by cannibals. He was insured for three thousand pounds, and out of this sum the shareholders were paid their first and final dividend of 150 per cent. It is to be hoped that the publication of this story will not have the effect of causing a great run on mining engineers, with the object of sending them, heavily insured, to inspect and report on properties in countries where they are likely to be regarded as additions to the visible food supply. At the same time there are some that might be spared; and there is a moral to the tale, indicating that even the most worthless of us may have his uses.

A DOMINION DEPARTMENT OF MINES.

Memorandum: Embodying the Views of the Canadian Mining Institute on the Organization, Purposes and Functions of a Federal Department of Mines; With a Note on a Proposed Mines Act.

In point of productive importance, mining occupies an eminently important position among Canadian industries. Thus the present mineral output exceeds in value and total exports of agricultural products, including animals and their produce; and considerably exceeds the value of the exports of the forest, fisheries and factories of the Dominion.

The development of the mineral industry in recent years is strikingly reflected by the official statistics of production. For example, in the year 1886 the mineral yield represented a value of, approximately, \$10.000.-000; in 1895, the valuation was \$20.000.000; in 1900. \$64.000.000; in 1905. \$69,500.000; and in 1910. \$105.-000.000; or an increase in twenty-five years of over tenfold. As a further illustration it may be pionted out that while in 1886 the mineral production represented only \$2.23 per capita of the population of the country. in 1910 it was equivalent to about \$13.00 per capita

There is, meanwhile, every likelihood that the future expansion of the industry will be at least commensurate with past achievement in this direction; more especially as new areas, notably in the direction of Hudson's Bay, in which the geological conditions for the discovery of minerals are peculiarly favourable, are about to be rendered accessible by the construction of railways thereto. It is eminently desirable that an industry of such importance to the country in general should be represented in the Cabinet of the Dominion Government by a minister, who, as such, would devote his time exclusively to the direction and administration of the Department of Mines. This plea has been repeatedly advocated by the Canadian Mining Institute, the

national representative body of the mining interests of the Dominion. It was first acted upon by the late Government, who introduced an Act creating the Department of Mines. Further, a Minister of Mines was duly appointed to assume direction of the Department, although the minister so appointed was also assigned the portfolio of Inland Revenue. It is obvious that there can be no logical association between these two departments.

Prior to the creation of a Department of Mines, the two mining services, namely, the Mines Branch and the Geological Survey of Canada, were branches of the Department of the Interior. The duties of the Minister of the Interior are, however, exceptionally onerous, and it was realized and admitted that while the mining services were attached to this Department they received but scant encouragement, attention or consideration. Again the two branches, each controlled by a separate director, were undertaking investigations or work on very similar lines; and since there was no attempt at correlation or co-operation, a duplicate of results to a very considerable degree was the natural consequence.

It was believed that by the creation of a Department of Mines, properly organized, this state of affairs would be remedied; but, unfortunately, the conditions have not been markedly changed or improved.

The Canadian Mining Institute, therefore, respectfully urges that the Department of Mines be placed in the same position in respect of efficiency and organization as the Department of Agriculture. Under the auspices of the Department of Agriculture, an important educational work has been successfully undertaken for many years past. Experimental farms have been established throughout the Dominion, including those provinces in which the Crown lands are under direct provincial jurisdiction; specialists are employed to visit the various centres and lecture on agricultural subjects; literature is freely distributed, and in many other directions the Department displays an intelligent and active interest in the welfare of this industry. To accomplish a like result it is important that the Department of Mines should receive the undivided attention of the Minister to whom its administration is assigned; and imperative that his chief adviser, the Deputy Minister, should not only possess the highest technical and scientific qualifications to successfully undertake the task of re-organizing the work of the Department, but also the necessary executive qualifications to successfully undertake the task of re-organizing the work of the Department.

In connection with the appointment of a Minister of Mines, two suggestions have been made, which are here outlined: The first is that the Department of Mines should also include and have jurisdiction over forest and water powers. This would then be in effect a Department of Natural Resources (exclusive only of Agriculture). The particular advantage of such a provision would be that practically all the technical or scientific work undertaken by the Government would be directed by the one Department. The other suggestion is that the Portfolio of Mines be assigned for a time, at least, to a member of the Cabinet without Portfolio. It was objected that such a course would be unprecedented. It may, however, be permissible to instance, by way of reply to such an objection, the appointment of the Hon. Adam Beck, in Ontario, a Minister without portfolio in the Provincial Government, to the ministerial direction of the Hydro-Electric Commission.

Dominion Mines Act.

The acquisition of title to mineral lands controlled by the Dominion Government has in the past, and is still, regulated by "Orders in Council." The effect of this system has been to produce a condition of uncertainty and instability, highly detrimental to the interests of mining in the country. The Canadian Mining Institute has, therefore, urged that an Act be placed on the Statutes, which will concisely define the requirements to be observed by those applying to the Crown for title to mineral rights. Acting on the invitation of the late Government, the Institute has drafted a Bill, which is now ready for submission to Parliament, and which it is hoped will commend itself to the favourable consideration of the Government. The principals enunciated by the Canadian Mining Institute in their Bill will unquestionably commend themselves to the Provincial Governments of the Western Provinces to whom it is understood the control of their natural resources will shortly be granted; and it is, therefore, probable, that if the Mines Act is passed by the Dominion Government, it will be unreservedly adopted by these provinces. Such a step would be obviously advantageous and would tend towards the establishment of an uniformity of the mining laws of the several provinces, an object the accomplishment of which the Institute regards as highly desirable.

CORRESPONDENCE

GOLD MINING IN NOVA SCOTIA.

Editor Mining Journal:—

Sir,—The letter you published on July 15th from Mr. Edgar H. Brennan is an appropriate sequel to that of Mr. J. Owen James, who, in the Industrial Advocate, of Halifax, imputed to me a number of statements of a fictitious character. To put quotation marks around such statements is not scholarly. Where he found them I do not know, nor does it matter. Most of them are not statements made by me. The criticisms on my little report upon the Nova Scotia goldfields deserve the kind attentions of a humorist; for, as yet, they are mere caricatures. Here is Mr. Brennan complaining loudly that I only made a hurried and superficial examination, and that "probably not having personally examined the Sterling, nor any gold mine in the Province approaching its depth, etc.," therefore my information was "circumscribed," "insufficient," and so forth. Mr. Brennan could easily have ascertained that I made a detailed examination of the Sterling, Dufferin, Richardson, Caribou, Brookfield, and indeed of all the large mines in the ergion. The Dufferin was unwatered for that special purpose. Naturally I have read Mr. Brennan's own most illuminating report with keen interest, as I did the valuable document submitted by Mr. C. Vey Holman to the Industrial Advocate. The people of Nova Scotia will have a large assortment of reports at their disposal if this curious controversy is continued.

London, Aug. 8. T. A. RICKARD.

CEMENT FOR STEAM AND WATER PIPES.

"Power" recommends the following formula: Paris white, 2 lbs.; litharge, 5 lbs.; yellow ochre, 1/4 lb.; and hemp cut up small, 1/4 oz. Mix well with linseed oil to the consistency of putty and use at once. The materials can be mixed dry, and sufficient for immediate use can be made up with linseed oil. This cement will set under water.

THE SOUTH AFRICAN HALF YEAR

A Comparative Study of the Principal Gold Producers of the Rand.

From Our Own Correspondent.

London, July 31st, 1912.

With the Witwatersrand still occupying the supreme position amongst the world's gold producers and with the industry having settled down now to a very fair investment level the particulars of its development are always interesting. The leading mines are divided amongst well-known groups and a review of their progress during the past half year is informative. An interesting series of articles published in a London daily newspaper enable some striking aggregate and comparative results to be tabulated.

Of prior importance is the Rand Mines-Central group covering sixteen properties, eleven of which secured larger profits in the half year ended June than the corresponding period of last year, the net result being a gain of over $1,100,000. Expansion has frequently been the result of the crushing of increased tonnage only, but in the main there has been a rise in average grade, this being sometimes partially absorbed by extra cost. Taking the case of one mine—the Village Deep—expenses had risen by 34 cents per English ton, but as there was an advance of 80 cents in average yield, the profit per ton advanced by 46 cents. The Bantjes Consolidated has benefited from a rise in grade which has been still more strikingly exemplified in the case of the City and Suburban, consequent upon the better developments in the deeper levels. The New Heriot has met reduced tonnage, arising from an accident, and higher costs by putting up the grade. The Nigel has met a fall in grade with greater tonnage and reduced costs.

Company.		Ore Milled, Tons.	Profit.
Bantjes Consolidated. . . .	1912	138.510	$174.730
	1911	131.457	141.500
City and Suburban.	1912	160.819	605.900
	1911	156.045	381.340
City Deep.	1912	235.730	675.000
	1911	131.693	191.515
Crown Mines.	1912	933.000	3.227.415
	1911	759,100	3.079.950
Durban Roodepoort Deep.	1912	143.125	187.195
	1911	128.360	154.750
Ferreira Deep	1912	210.270	1.132.435
	1911	183.004	981.250
Geldenhuis Deep	1912	337.960	448.300
	1911	403.230	648.325
Jumpers.	1912	50.740	47.915
	1911	64.890	137.875
New Heriot	1912	68.060	270.620
	1911	72.623	271.340
New Modder.	1912	281.000	1.139 990
	1911	269.700	850.185
Nigel.	1912	78.950	126 635
	1911	54.750	102.400
Nourse Mines	1912	316.600	661.675
	1911	331.401	630.030
Robinson Gold	1912	279.600	1.993.295
	1911	295.100	2.341.500
Rose Deep.	1912	381.800	1.041.345
	1911	331.100	821.500
Village Deep	1912	296.800	674,200
	1911	274.900	489,500
Village Main Reef.	1912	237.395	1.038.250
	1911	239.850	1.159.895

Another important group is the Barnato which makes a uniformly good showing, only one property retrogressing. This group is believed to have benefited almost entirely by the abandonment of the policy of low costs at any price which old policy too often meant the milling of unprofitable ore. Under the new method costs have certainly increased, but the more careful selection of ore has brought improved profits. Several properties have scored by crushing more material. The fall in yield at the New Pimrose is probably the natural result of the efforts to prolong the life of the rapidly dying mine.

Company.		Ore Milled. Tons.	Profit.
Consolidated Langlaagte.	1912	123.627	$260.470
	.1911	125.249	171.560
Glencairn.	1912	110.773	81.535
	1911	112.385	62.585
Ginsberg.	1912	81.721	192.915
	1911	66.153	135.720
New Primrose	1912	141.400	524.080
	1911	139.321	570.025
New Rietfontein	1912	95.057	119,445
	1911	85.915	103.815
New Unified.	1912	63.570	147.555
	1911	60.852	125.475
Witwatersrand Gold	1912	223.896	533.030
	1911	207.870	466.645

The Neumann group controls five important properties and, on the whole, does not show up so well, three of its mines showing diminished profits. In each of these cases the yield per ton shows a clear shrinkage, although this has not always been the main cause of the decline in earnings. In the Witwatersrand Deep the enormous drop in earnings was mainly due to the flooding of the mine.

Company.		Ore Milled. Tons.	Profit.
Consolidated Main Reef..	1912	123.888	$254.335
	1911	126.872	233.995
Knight Central	1912	142 162	119.930
	1911	150.336	151.025
Main Reef West.	1912	97.371	274 945
	1911	95.398	333.565
Witwatersrand Deep . . .	1912	224.300	471.950
	1911	270.526	859.835
Wolhuter.	1912	174.750	451.455
	1911	169.615	425.640

The Robinson group only controls two mines, but these also show up unsatisfactorily. In the case of the Randfontein Central the profits are only shade down in the comparative period, but in view of the tremendous increase in tonnage a substantial expansion of profits was naturally looked for. With regard to the other company the decline in profits is chiefly a matter of grade.

Company.		Ore Milled. Tons.	Profit.
Langlaagte Estate	1912	313.883	$396.250
	1911	312.502	638.250

Randfontein Central	1912	1,264,840	1,980,250
	1911	930,502	1,995,000

Better results are shown by the Albu group from its seven properties and here again the improvement is scarcely as much as might have been looked for in view of the extended scale of operations. Increased costs ranging from 16 cents per ton on the part of the Aurora West to 36 cents per ton in respect of the West Rand Consolidated account for the difference.

Company.		Ore Milled, Tons.	Profit.
Aurora West	1912	76,516	$ 83.210
	1911	66.186	77.340
Cinderella	1912	102,718	120.900
	1911	95,746	116.345
Meyer and Charlton	1912	83.477	489,270
	1911	35,715	132.485
New Goch	1912	158,653	144,855
	1911	166.822	376.105
Roodepoort United	1912	179,661	132,010
	1911	186.960	190,795
Van Ryn	1912	232.450	709.220
	1911	194.320	640,300
West Rand Consols	1912	166.100	140.270
	1911	148.090	120,450

The Farrar group is another one which shows decline, although less than has been anticipated. The grade of the East Rand Proprietory has been put up practically $2 per ton; with costs $1.50 higher, the net gain in average profit has not been sufficient to offset the reduction of 174.000 tons in the output.

Company.		Ore Milled, Tons.	Profit.
East Rand Proprietory	1912	945.000	$2,649.770
	1911	1.119.560	2.673.120
New Kleinfontein	1912	247.530	515,000
	1911	223,554	583.725

Very mixed results are shown by the Goldfields group. The seven important properties under its control earned between them $210,000 less during the past six months than in the first half of last year. In the case of the Luipaard's Vlei an advance in the expense ratio in conjunction with a slight decrease in tonnage has cut down the profits 50 per cent.

Company.		Ore Milled, Tons.	Profit.
Jupiter	1912	231.700	$154.525
	1911	143.050	94.220
Knights Deep	1912	352.630	541.465
	1911	353.830	737.610
Luipaard's Vlei	1912	99.274	36.665
	1911	101.422	76 155
Robinson Deep	1912	301.900	1,083.125
	1911	286.500	917.695
Simmer and Jack	1912	434.000	1.307.705
	1911	424.500	1.470.750
Simmer and Jack East	1912	188.060	119,650
	1911	176,270	78.715
Simmer Deep	1912	277.400	102.975
	1911	258,050	181.280

The only other outstanding group is the Goerz group and the four properties here in the aggregate give disappointing results. The May Consolidated was expected to show a reduction in view of its approaching exhaustion, but the Lancaster West and the Princess Estate, which have been amalgamated and considerably re-organized, were expected to show up much better. The Geduld shows some expansion in profit as a result of the enlarged scale of operations. Princess Estate operations were impeded during the re-organization and better results are looked forward to in the future.

Company.		Ore Milled, Tons.	Profit.
Geduld Prop.	1912	84,320	$127.700
	1911	68.710	96.065
Lancaster West	1912	125.720	37.955
	1911	128,930	141.080
May Consolidated	1912	78,152	194,005
	1911	91.340	332.670
Princess Estate	1912	101.967	*19.235
	1911	80.640	142.830

* Loss.

Apart from the above groups, the Brakpan is the only other important undertaking. This mine treated 287,000 tons for a profit of $915,000, the grade being $7.54, and costs $4.38. These compare favourably with the results obtained last year.

TECHNICAL LITERATURE

GEOLOGY.

The Genesis of the Diamond.—In the July-August issue of The Journal of Geology, Mr. Orville A. Derby, of the Geological and Mineralogical Service of Brazil, discussing the genesis of the diamond, suggests the hypothesis that the diamond is a secondary mineral crystallized out of some carbon-bearing solution that was capable of dissolving the rock (or some parts of it) in which it occurs and thus of opening space for it. This hypothesis, he submits, can be easily reconciled with the geological conditions in which the diamond occurs in its parent rock, in so far at least as these conditions are known at present. Thus, (1) the diamond occurs in the form of isolated complete crystals closely enclosed in a rock of eruptive origin, occurring in dikes and pipes and having the readily alterable minerals olivine and pyroxene as its leading essential constituents. (2) This rock, wherever diamonds have been found in it, shows evidence of having been fractured after its consolidation to such an extent as to permit a sufficiently free circulation of subterranean solutions to produce a very advanced stage of alteration in all its olivine-bearing portions, so that the only portions that remained perfectly fresh are certain unfractured pyroxene-garnet segregations free from olivine. (3) The circulating solutions introduced water (locked up in the serpentine and other secondary minerals) and carbo (locked up in the calcite), both of which were lacking in the original rock. (4) The circulating solutions attacked the garnet of the enclosed pyroxene-garnet segregations wherever these were sufficiently fractured to permit it, producing an alteration crust of secondary minerals. Unfractured segregations would naturally be attacked only on their surfaces adjacent

*The English sterling equivalents have been translated into American currency at the rate of 2 cents to the penny for the small figures and 5 dollars to the pound for the big sums.

to the more fractured and thus more permeable olivine-bearing portions of the rock, and thus their (presumably) rounded original form would be accentuated through corrosion, giving them the aspect of water-worn pebbles. (5) After (or concurrently with) the alteration of the garnet, carbon crystallized in the form of diamond adjacent to the secondary crust formed on the former mineral, and also, as Beck demonstrated, in his study of the diamond-bearing nodule from the Newlands mine, in the form of graphite.

ASBESTOS.

Russian Deposits.—A series of articles is now appearing in the London Mining Journal on the economic mineral resources of Russia. In the issue for August 3rd, Mr. E. de Hautpick describes the asbestos deposits. Asbestos is found in Russia in the Urals, in Siberia and in the Caucasus, but production is mainly derived from the Ural field. The principal mines here are in the Ekaterinburg district, in a zone of serpentine rocks extending for a distance of about six miles, and about 1,400 yards wide. The asbestos produced, representing nearly one-third of total production of the Urals, is said to be of very fine quality, comparable with the high grade crude of Canada and Piedmont. The veins are very irregular, and variable in declination and extent. The writer states: "The fall varies between 0 degrees and 360 degrees, now parallel to the level, now thrown vertical, now pinching out, and again appearing. One and the same vein may be followed on two opposite edges of the cutting over a distance of 70 to 100 feet. Only in parts of greatest thickness, or of accidental accumulation, are cuttings made. . . . . The production of the asbestos is conducted by means of open cuttings down to a depth of 70 feet, leaving recesses of 14 feet, besides which, with similar cuttings, one or two approaches are made, from which there branch approaches to each level. The yield of asbestos varies from 0.6 to 1.2 lbs. per cubic foot of serpentine rock." Mining is apparently of the most primitive character and there is no attempt to recover the asbestos from the smaller veins. Nevertheless the industry is developing very rapidly, production having nearly doubled in five years. The output in 1911 was 15.872 tons. Other districts in the Urals are those of Bogosloff, also in the south, but the best asbestos is stated to be obtained from mines on the Asbestovoy Hills, on the River Sissert, and from deposits of the Shelkovoy Hill, between the Shuralinsky and the Teploy Hills. Mines are also worked in the Orsk and Troitzk districts. The asbestos is graded to (1) lengths of 1 to 1¼ inches and more for spinning; (2) medium (⅝ to ⅜) for boards; and (3) short lengths and asbestos flour for making fireproof materials. The chemical composition of the Ekaterinburg asbestos is: SiO_2, 41.40; MgO, analysis of the Urals olivine rock may also be interest- 41.06; Fe_2O_3, 2.03; Al_2O_3, 1.11; H_2O, 14.37=99.97. An ing: SiO_2, 36.30; MgO, 34.84; Al_2O_3, 1.12; Fe_2O_3, 5.28; Cr_2O_3, (F_2O), 7.95; H_2O, 15.26.

There are numerous occurrences of asbestos in Siberia, but it is mined in the government of Yenissei only. The mineral occurs there in dolomite veins attaining to widths of over four feet, of which, however, only a seventh of a foot is commercially recoverable. The yield of asbestos is from 2.5 to 4.5 lbs. per cubic foot of rock. I nthe Caucasus asbestos is, at present, produced in insignificant quantity from the Sharopan district. There are numerous promising undeveloped areas. In fact, from the information here afforded, it would seem that the Russian asbestos industry is merely in its infancy, and that scientific exploitation and the introduction of modern methods of mining and milling may very readily result in the development of the industry to a degree that would challenge Canadian supremacy.

COAL.

Use of Stonedust in Mines.—We recently reviewed in this column a paper in which the use of stonedust as a means of preventing coal dust explosions was advocated. The first report of a committee appointed by the British Government to investigate the question of explosions in mines, has since been issued. This committee, while remarking that the experiments so far as they have gone, are sufficiently striking to merit serious attention, consider that further experimentation is necessary before any final recommendation can be made. The effect of the stone dust on health is also considered, the conclusions reached by the expert to whom this investigation was submitted being that: (1) The effects produced vary with the time of exposure and particularly with the quantity and quality of the dust which is inhaled. (2) The more concentrated the dust in the atmosphere the more rapidly will fibrosis be produced; and the more irritating the dust the more intense will be the fibrosis. (3) The inhalation of such stonedusts as are rich in silica seems particularly injurious. (4) That powdered shale (used in the experiments to which we called attention) does not produce more irritation in the lungs than does coaldust, and judging by the comparatively non-injurious effects of coaldust on the general health of the workers, powdered shale may be regarded as comparatively harmless.

LOW GRADE ORES.

The Successful Mining of Low Grade Ores.—The Mining & Engineering World directs attention in a recent issue to the success now attending the operation of low grade ores in America.

Our contemporary remarks:

"The conditions of mining have so changed that it is the low grade mines that are paying the steadiest and most certain dividends. This is made possible only by the advanced state of mining, transportation and reduction guided by men of the highest technical and business ability. Profits are not now measured so much by the grade of the ore as by the quantity handled and the degree of economy practised at every step. The magnitude of the results achieved are illustrated by operations of the great dredging plants on the gold placers of California, the Homestake of South Dakota and the Alaska Treadwell of Alaska, the great porphyry coppers of Utah, Nevada and Arizona, and others. The Homestake has paid in dividends to date over \$22,000,000; the Alaska Treadwell, nearly \$12,500,000; the Utah copper, nearly \$14,500,000; and the Nevada Con., nearly \$8,000,000. The great copper mines of the Lake Superior region belong to the low-grade class yet they have been remarkable dividend payers as will be seen by reference to the dividend table on another page. As an instance may be cited the Calumet & Hecla, which has paid dividends to the total of very close to \$118,000,000. Other big properties are now getting under way and will be heard from in due time." The grade of ore, then, is of less consequence than the size and uniformity of the deposit and the economy with which the product may be handled and converted into money. The progress that has been made in recent years in making it possible to profitably operate low-grade mineral deposits has been due to great changes in mining

nd metallurgy, and the application of up-to-date bus-ness methods. There is no reason to believe that this .dvancement has yet reached its highest point, or any-vhere near it. It is not at all improbable that what re now call low-grade ores, will some day be looked ipon as rather high grade.

In Canada the profitable mining of the low grade :opper ores of the boundary district in British Colum-bia is another case in point.

ASBESTOS.

One of the Inspectors of Mines of South Australia has reported on two asbestos properties in that state, one of which is situated in the Hundred of Bright, 23 miles northeast from Endunda, and the other in the Hundred of Arkaba, 9 miles from Hawker. In each case the asbestos occurs in small seams and bunches of from 1 to 4 inches wide. The asbestos-bearing forma-tion is said to be decomposed slate and sandstone. The asbestos is of the blue variety known as Crocidolite, of fairly good quality, estimated to be worth from $50 to $75 a ton; while it is anticipated that a large quantity is available.

COAL.

The Difficulties of Colliery Management.—In a paper contributed to The Canadian Mining Institute a year or so ago by Mr. W. D. L. Hardie, of Lethbridge, atten-tion was directed to the increased difficulties of colliery management due to recent industrial progress and in-vention, including, for example, the extended applica-tion of electricity to colliery working, and, in general, the employment of new appliances and methods in con-trast with the simplier if less efficient means of coal-winning of even twenty-five years ago. Mr. W. C. Blackett, the newly elected president of the North of England Institute of Mining Engineers, in the course of a speech at a meeting of this society in Newcastle a week or so ago, gave expression to very similar ideas, but showed that the lot of the mine manager in Great Britain was rendered the more irksome by the annoy-ing and eccentric legislative provisions recently enacted, such for instance as that requiring the manager to sign from two to three hundred documents a day. Sixty years ago, Mr. Blackett remarked, the manager actu-ally had leisure to devote to the real object of his pro-fession. He could study and devise means whereby disasters and accidents could be avoided. "To-day, the mining engineer of the North of England and elsewhere in the kingdom was spending the most strenuous mom-ents in his life in devising ways and means of meeting all those Acts of Parliament and all those Orders in Council, and so had no time left to indulge in scientific pursuits."

COAL.

A new device, the object of which is to minimize the liability to misfire when shotfiring by electricity is now in use in some of the Welsh collieries. An essential part of the appliance consists of a detonator shield of copper or other suitable material, to the base of which the cables are attached, so that the detonator iself is re-lieved of all stress. For the insertion of the detonator and shield an appliance is employed comprising an ex-ternal copper tube graduated for measuring the depth of the hole, and an internal copper rod, fitted with a removable spike. In operation the base of the primer is opened with the copper spike to a convenient depth for accommodating the detonator and shield. These are then passed through the tube by means of the cop-per rod, from which the loose spike has been previously removed, and inserted in the primer. To provide against the dislodgment of the detonator upon the withdrawal of the rod, the shield is provided with tongues engag-ing with the cardboard base of the primer. These tongues aer designed to collapse under a pull of about 10 lb., to enable the detonator to be withdrawn in the event of a misfire, by tugging on the shotfiring cables. The detonator having been placed in position, the hole is stemmed, a semi-circular rammer being used for the purpose, while the balls of stemming employed are shaped on a former to fill the section of shothole unoc-cupied by the inserting appliance. This has the ad-vantage that the cables, which pass through the tube, are not subjected to force liable to cause abrasion of the insulation—a conspicuous cause of misfires. When the stemming has reached to within from 4 to 6 inches of the mouth of the hole, the copper tube is withdrawn and the orifice is completely stemmed. The shot is then fired in the usual way. Should a misfire occur the de-tonator and shield can be withdrawn immediately by hauling on the cables, after which the hole may be ap-proached with impunity. The advantages claimed for the appliance are greater safety in handling simplicity in use, and the obviation of the possibility of unspent detonators being left in the coal to the peril of the workman and the consumer.

DRILLING.

Commenting on a dust eliminator in connection with drilling machines, invented by Thomas Mitchell, fore-man of the North Butte Mining Company, "Mining Science" states that the apparatus does not conflict with the changing of drills, and the device can be manu-factured for 50 cents. An exhibition test demonstrated that not a particle of the dust from the drilling escap-ed, being all caught in a canvas tube. By way of com-parison, the drill was operated without the eliminator, and within a few seconds the air in the raise was filled with dust-particles which presently were so thick that it was difficult to distinguish persons at a few feet dist-ant by candle light. A patent has been applied for, and already some of the mines of the Anaconda Company are using the apparatus.

ZINC.

Zinc Dust as Precipitant.—The problem of the physi-cal constitution of zinc dust was recently investigated by Mr. M. T. Murray (Jour. Chem. Met. and Min. Soc. of S. Africa, 1911). Screening tests showed the follow-ing: None of the material remained on a screen with aperture 0.0197 in.; 94.5 per cent. of the whole passed the smallest screen used (aperture 0.0030 in.). The average diameter of the particles was calculated as 0.0011506 in., which corresponds to a surface of 144.8 sq. ft. per lb. of material; this is about three times the surface exposed by 1 lb. of filiform zinc. Under a mic-roscope, zinc oxide and other impurities were seen to be present, but quite separate from the metallic particles which were approximately spherical and retained their bright metallic lustre even after several weeks' exposure to the atmosphere. H. A. White stated that a threefold increase of surface was insufficient to account for the greatly increased rate of precipitation by zinc dust compared with that obtained in the usual extractor boxes, so that there must be another factor envolved.

NICKEL.

The Mining and Scientific Press suggests that the nickel deposits of China are, through the re-organiza-tion of the government and the building of railways, becoming more of an economic possibility. Nickel is

believed to occur extensively in Southwestern China. From time immemorial the Chinese have smelted mixtures of tin, lead, zinc, copper and nickel ores, forming natural alloys of variable composition which approximate German silver. Comparatively little is known, however, of the source of the nickel ores, since they occur in Southwestern China, where, until recently, it has been impossible to carry on systematic exploration on account of the difficulties of travel and of the hostility of the native tribes. Within the last few years railways have been built through this area, but so far apparently no attention has been paid to the nickel deposits. Duclos, the engineer who accompanied the Mission Lyonaise, reported that he found nickel ores occurring associated with copper in two localities in Yunnan and Ssu-chuan. The ores must be comparatively rich, otherwise the Chinese never would have worked them by their native methods. They do not commonly work copper ores of a lower grade than 15 per cent.

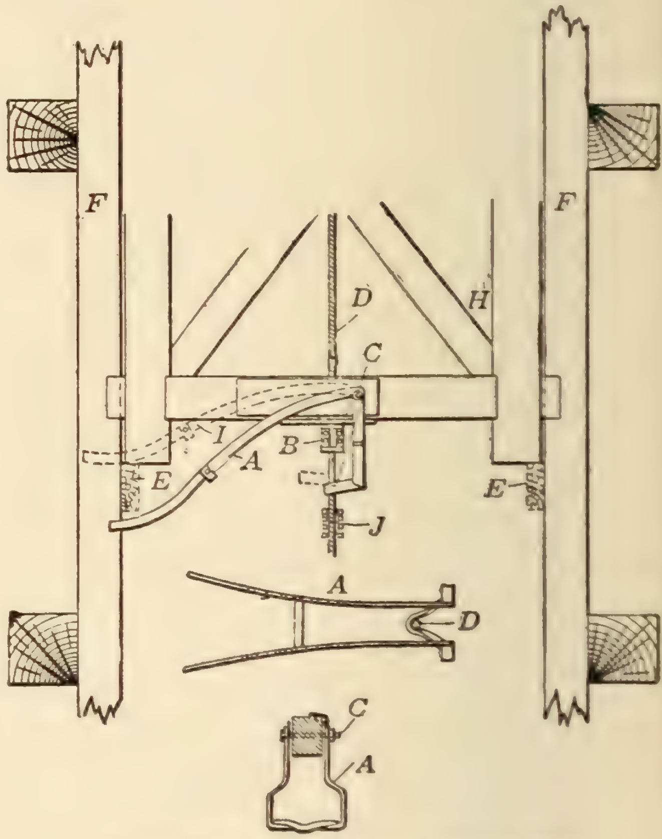
A CHEAP METHOD OF STOPING.

Mines and Minerals for August contains an interesting article on the timbering methods and the filling system as employed by the Homestake Mining Company, Lead, South Dakota, in which the costs are compared of three methods of stoping, namely with timber, by the so-called Homestake method and by the present system, are compared, showing the very considerable economy effected by the latter. The present system does away with all the sill floor timbers. Drifts are excavated in the hanging wall and in the footwall, a short distance from the ledge. The ore body is then divided into stopes 60 feet wide and pillars 40 feet wide. A 6-foot cross-cut is driven through the centre of each pillar from the hanging wall to the foot-wall. Along the cross-cuts, headings are driven about every 30 feet, and extend from the cross-cut in both directions to the stoping ground. The stope is then opened by taking out ore through the headings on either side of the stope. On one side only of the stope timbered manways are carried upwards as the stope progresses. These manways are not in the pillar, but in the broken ore, a few feet from the pillar. As the ore is drawn out into the cross-cuts, the miners are at work on top of the broken mass. Shovellers keep the ore drawn off just sufficiently to give the miners enough room for their work. With this system the stope can be worked about 120 feet high. When this quantity of ore has been taken down, raises are driven to the level. Then the ore is entirely removed, a mud-sill is laid down, and the waste thrown in. The stope is next filled with waste, nearly to the arch of ore between it and the level above. When the filling is completed, square-set timbers are placed on top of the filling and the remaining arch of ore is taken out, the square sets acting as supports. A stope on one level is directly below a stope on the level above. As the arch is removed, waste rock is filled into the timbered part of the stope. After all the stopes are worked out and filled, the pillars of ore that have been left are worked by means of ordinary square set timbering. The waste rock is prevented from running into the slope by lacing the outside set of timbers. The features of this method are: Levels may be placed at comparatively long vertical intervals; a minimum quality of timber is used; ore is broken at a small cost; nearly all the ore can be extracted; the output is large and regular; there are always large ore reserves, broken and in the pillars. The system has, moreover, resulted in a saving in costs of 22 cents pe ton compared with the old method of timbered stopes.

SAFETY CROSSHEADS FOR HOISTING BUCKETS.

Because accidents have been caused by the falling of crossheads in shafts, the Canadian Bureau of Mines calls attention (in its report for the year 1911) to the safety crossheads that have been designed and patented by Mr. Morin, master mechanic at the Nipissing, and Mr. Sargeson, master mechanic at the Waldman Mine.

The object of the design of these crossheads is to prevent them from falling when they stick in the shaft. In the Sargeson crosshead, which is shown in the accompanying illustration, the attachment A is fastened to the crosshead at C. If the crosshead sticks, this arm automatically engages the clip B, attached to the cable, and so stops the bucket. In sinking operations the arm A is automatically tripped by the stop block E, allowing the bucket to descend to the bottom of the shaft.



Safety Crosshead Used at a Cobalt Mine

In the accompanying illustration, A shows the attachment in normal position; I, the attachment tripped by the crosshead stop; B, the clip in normal position; J, the clip lowered through the tripped attachment; C, the draw pin; D, the cable; E, the crosshead stops; F, the guides; and H, the crosshead.

The same principle is followed in the design of the Morin crosshead in the bucket follower, shown in the illustration. It is further equipped with an automatic safety device, which, by the aid of springs, enables dogs to grip the guides, thus preventing the crosshead from falling.

CHIBOUGAMAU REGION OF QUEBEC

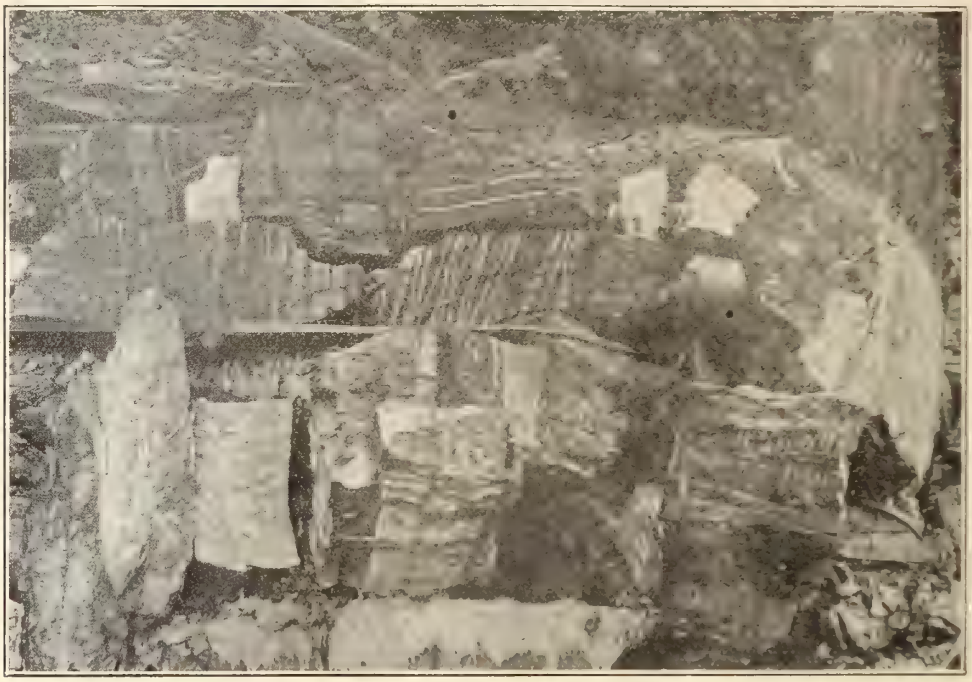
The accompanying illustrations are reproduced from some of the admirable photographs taken by Dr. Alfred E. Barlow on the occasion of his visit to the Chibougamau region last year.

In spite of the fact that the Commission's report was in general adverse, there is still considerable interest in this area and it is even possible that further exploration and prospecting may result in discoveries of economic value.

Our first illustration is of the McKenzie gold mine, which we understand was regarded as being a promising prospect by Mr. John E. Hardman.

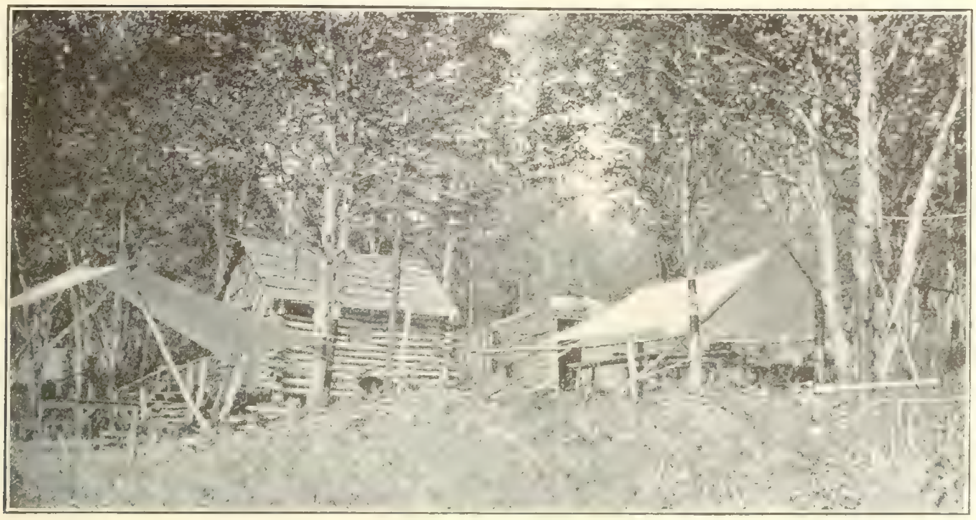
McKenzie Gold Mine, Portage Island, Lake Chibougamau

The second illustration shows specimens of so-called asbestos, but mostly picrolite, obtained from one of the



Specimens of so-called Asbestos (mostly picrolite.)—Pit No. 5, Asbestos Island, Chibougamau

Professor Gwillim and Mr. Bateman at work in the Sampling Mill, Pointe aux Bouleaux



Headquarters' Camp.—Pointe aux Bouleaux, Portage Island, Lake Chibougamau

pits on Asbestos Island.

The third photograph presents a most characteristic portrait of Prof. Gwillim, one of the members of the Commission, engaged in the task of sampling, while the fourth illustration is a view of the Commission's headquarters' camp, and also gives some idea of the vegetation in Northern Quebec.

THE GREAT COBAR, LIMITED

(Abstract from the Mining and Engineering Review.)

Next to Broken Hill, Cobar is the most important metal mining centre in the State of New South Wales, and the future of the town and district is wrapped up in the fortunes of the Great Cobar, Ltd. The mines owned by this company are the Great Cobar, Cobar Gold (Fort Bourke), Chesney Copper, and, some six miles further south, the Peak and Conqueror gold mines. Midway between the Great Cobar and the Peak is the Occidental gold mine. Apart from the foregoing, any other mines in the immediate vicinity are either unworked or operating on a very small scale.

The predictions of Mr. H. C. Bellinger, the general manager, are that the annual production of the mines will shortly reach 10,000 tons of copper, 50,000 oz. gold, and about 250,000 oz. silver per annum. For many years the Mount Boppy G. M. Co. at Canbelego, some thirty miles from Cobar, held the record as the largest gold producer, but now that the ore from the Fort Bourke mine is being treated, the Great Cobar, Ltd., holds the pride of place, both in regard to copper and gold. The following table shows the output during the last six years:

Output of Great Cobar Mines.

	Ore Raised.	Blister.	Value.
1906	198,168	4,030	....
1907	167,005	3,459	......
1908	234,877	5,127	334,251
1909 (10½ months)	203,746	4,855	378,842
1910 (10½ months)	298,652	6,248	524,000
1911	346,303	6,548	366,688

From 1876 to the end of 1911 the production of copper stands at 89,009 tons.

In order to show that the returns are steadily increasing, the figures for the first five months of the present year may be quoted:

	Copper. Tons.	Gold. Oz.	Silver. Oz.
January	423	2250	16,751
February	504	2180	13,767
March	576	3920	23,716
April	583	5147	32,744
May	701	5137	21,561

The main shaft at the Great Cobar mine is down to a depth of 1,400 feet. Its dimensions are 15 feet by 8 feet, in three compartments, two of which are for hauling, and one for pumping, air pipes, and ladderway. The shaft is equipped with a pair of coupled horizontal expansive non-condensing Corliss valve winding engines by Andrew Barclay and Sons. Cylinders, 22 in. diameter by 48 in. stroke; winding capacity, 2,000 feet per minute, with a 2-ton load of ore. The drums are 10 feet in diameter by 4 feet, and are fitted with steam release brakes. The loose drum is also fitted with steam released friction clutch and hand brake.

The head gear is 67 feet in height to the centre of the winding sheaves, and is constructed of steel sections. Each cage lifts two 16 feet cubic feet capacity, box pattern mine trucks to the brace, and lands on chairs. The trucks are then pushed over the bin and tipped by means of rotary tippler into the brace bin, which holds 450 tons. From this bine the ore is fed through pneumatically operated doors to two Hadfield-Heclon gyratory breakers, then over the picking belts and into the bedding bins. From here it is waggons, and a small portion from each waggon is loaded into a special

truck, which, when full, is delivered to the sampling mill.

The Sample Mill.—The ore is delivered to a Babcock and Wilcox tray conveyor of the endless chain end discharge pattern, having a capacity of 50 tons per hour at 45 f.p.m. This delivers on to a similar conveyor rising at an angle of 20 deg. This conveyor delivers to a No. 5 McCully gyratory ore discharged into 30-ton capacity steel hopper ore breaker. The ore is then lifted by a belt elevator (66 feet centres), which delivers to a 64-in. Simplex sampler, 15 per cent. cut. The sample then gravitates to a No. 3 McCully crusher. This delivers to a 44-in. sampler, 20 per cent. cut. The sample then gravitates to a 24-in. x 14-in. rolls, 69 r.p.m. It is again sampled with a 28-in. sampler, 15 per cent. cut, and again passes to another set of 24-in. x 14-in. rolls, 144 r.p.m. The product then passes to a 28-in. sampler, 15 per cent. cut, and from there gravitates to a sample grinder.

Before briefly describing the smelting equipment, a few words may be written regarding the company's mines.

The Great Cobar Mine.—According to Mr. J. E. Carne (assistant Government Geologist), the Cobar lode consists of three lenses, extending in a N. 10 degree W. direction, with a slight dip to the east. The centre or principal lens has an average length of about 450 feet, and a depth of about 70 feet (the maximum being 120 feet at the 800 ft. level). The north lens is separated from the centre by 140 feet of mineralized slate carrying low-grade ore. Its length, so far as proved, is 300 feet, and its width 90 feet. The south lens is separated from the centre by a blank of about 50 feet in the upper levels, but merges into it below No. 3 level. Its width averages 50 feet, the maximum being 75 feet in No. 7 level, and its greatest length 150 feet. South of this lens the ore dies out in country, though slight metal values and quartz leaders continue in the rubbly channel slate.

The ore lenses are simple impregnations and replacements in slate and fine sandstone, with more or less quartz in places. Iron and copper sulphides occur solid for the most part, but are occasionally mixed with slate and quartz, the north lens being especially basic even where low in copper. No true eastern wall exists, the ore dying away gradually in the country, and in the mineralized slates between lenses. A marked distinction, however, is noticeable between the channel slate and the west country, the latter being more jointed and blocky.

During the reorganization of the surface plant, development work undergound has been pushed ahead, and the ore reserves exceed 2,000,000 tons, averaging 2.6 per cent. copper and 1 dwt. gold.

The Cobar Gold Mine.—The next most important mine, although the most recently secured, is the old Fort Bourke, purchased from the Cobar gold mines in 1910 for the sum of £120,000. The Cobar Gold Mines, Ltd., was registered in 1896 and reconstructed in 1898. The plant included a mill of 100 stamps, and, when the ore became too refractory to treat by amalgamation, something like £80,000 was frittered away in fruitless experiments. When the company shut down the ore reserves amounted to 141,053 tons, assaying 1.3 per cent. copper and 10.5 dwts. gold. The ore is now dumped into large storage bins and railed to the smelters as required. The total output of gold to the end of 1907, according to official returns, was 113,509 oz., valued at £351,101, and the present production is approximately 3,000 oz. per month.

The ore reserves total some 350,000 tons, averaging 1.5 per cent. copper and nearly 10 dwts. gold. No dividends were ever paid by the old company, but the mine will go a long way towards providing an adequate return to the present holders.

The Chesney mine was originally worked as a gold proposition, and a large quantity of the auriferous slate from the oxidized zone was treated by battery and amalgamation, the outcrop betraying no evidence of the copper ores below. In 1901, about 4,500 tons were treated at the Great Cobar smelters, for a return of 3 per cent. copper and 1 dwt. gold per ton; and in 1904 the property was purchased by the present owners. The shaft is 800 feet deep. At the 464 feet level the ore body has been worked for a length of over 800 feet, with an average width of nearly 40 feet. The Fort Bourke ore, being richer in gold, now forms the main siliceous flux, and consequently the reserves at the Chesney mine are not being extracted on a large scale. The ore reserves total 750,000 tons, averaging 2.7 per cent. copper and 1 dwt. gold. The value of the Chesney southern ore body at numbers 6 and 7 levels south is, however, nearly 4 per cent. copper and 6 dwts. gold.

The Peak mine is also a valuable property, and has been a consistent producer for the past 18 years. Last year what is apparently a continuation of the lode was discovered, containing high gold and silver values. Further development work is being carried out to determine the tonnage available. All the mines are under the management of Mr. Nicholas Treloar.

Smelting Department.

There are four blast furnaces, each 240 in. by 56 in., at the tuyeres, with a total capacity of 2,000 tons per day, although at present the average does not exceed 1,250 tons. The proportion of ores from the various mines used in the furnace charges is approximately four parts of Cobar ore to one part of siliceous ores from the Cobar Gold, Chesney, or Peak mines. No ordinary furnace slag is used on the charge, but the converter slag is retreated to recover its values. When the scheme of reorganization is complete, and production on a large scale commenced, the output will perhaps exceed the figures mentioned by Mr. Bellinger. The only other factor is the price of copper, and at anything like present figures large profits can be earned.

There are two tiers of water jackets, five upper and five lower, 10 ft. by 4 ft., with 5 in. water space on each side, and one upper and one lower at each end. The bussel pipe supplying 40 tuyeres is 34 in. in diameter, whilst the blast main is 42 in. diameter. The height from ground to tapping floor is 8 ft. 6 in.; from tapping floor to charging floor, 26 ft. 6 in.; from charging floor to top of superstructure, 16 ft. 3 in.; from top of superstructure to top of auxiliary stack, 34 ft.; from top of superstructure to top of down-take, 19 ft. 6 in.; from ground to top of auxiliary stack, 85 ft. 3 in.

The furnace charge cars are 34 and 44 cubic feet capacity. They are hauled up the incline by a motor-driven geared winch, capable of hauling 8 tons up a gradient of 1 in 8 at the rate of 8 tons per hour

The molten metal from the furnaces is continuously run into forehearths or settlers. Originally five circular settlers, 18 feet in diameter and 4 feet 6 in. deep, capacity when lined 389 cubic feet, were installed, but now only two of this type, those at the extreme ends, are retained.

Between the furnaces, where one circular settler was formerly used, two of the oval type have been placed, making a total of eight. The dimensions of these latter are 9 ft. 6 in. by 4 ft. 6 in., capacity 270 cubic feet. From these forehearths the slag forms a continuous flow on the east side, delivering into slag pots. The matte is tapped intermittently on the west side (which is the converter building) into 8-ton segmental matte ladles.

There are four standard improved Berg cinder cars, 200 cubic feet capacity, 80,000 lbs. capacity, fitted with automatic couplings. The slag pot is supported directly within the C.I. trunnion ring, and is tipped to either side of the track by forged worm and cut gears electrically operated. There are also three Dewhurst's patent end tipping slag ladles and cars, capacity 10 tons, and two Dewhurst's patent side tipping slag ladles and cars, with split ladle. Capacity of ladle, 280 cubic feet.

The converters are of the barrel type, 84 in. by 126 in., carrying 14 tuyeres. There are three blowing stands, set end to end, and blowing into a common flue, with dust chamber inserted along the flue. The gases from the converter pass into hood; from hood into C.I. flue; from C.I. flue to dust-settling chamber; from dust-settling chamber to brick down-take; then through underground flue to fume scrubber; from scrubber to brick stack. The converters are handled by two 40-ton electric overhead cranes manufactured by Messrs. Babcock and Wilcox, Ltd. These cranes will hoist 40 tons at 16 ft. per minute. Transverse travelling, 110 f.p.m.; longitudinal travelling, 250 f.p.m. Span of crane, 49 ft. 8 in., centre to centre of rails. Height from ground to top of crane rail, 36 ft. Crane controlled by driver in cab, travelling with main girders. Each crane is fitted with an auxiliary hoist of 5 and 10 tons capacity.

Mr. F. J. Murphy, who has had experience on all the principal smelters in the United States, is in charge of the furnaces.

Power Generation.

The power generating station is not by any means the least important section in such an undertaking. The boilers, numbering six, each having a heating area of 3,580 square feet and a grade area of 70 square feet, are of the Babcock and Wilcox make, fitted with chain grate stokers and superheaters. The coal is unloaded direct into a steel hopper, the top of which is at rail level. This hopper feeds direct into a B. and W. four-roll coal crusher, from which the coal gravitates to the rotary feeder, which feeds a B. and W. standard gravity bucket conveyor. This conveyor elevates the coal over steel hoppers, set over and in front of the boilers which deliver through doors to the mechanical stokers. The conveyor buckets are dumped by means of mechanical dumpers over any of these hoppers. The conveyor then returns under the boiler-room floor, where the ashes are loaded into same. When ashes are being loaded all the buckets are dumped over the ash hopper, which delivers into railway waggons.

Steam is supplied to three Browett-Lindley forced lubrication, three-crank, three-cylinder, triple-expansion, vertical engines, each of 250 i.h.p. They are directly connected to three Siemens' three-phase alternators, each 300 kw., 355 k.v.a., 440 volts, 50 periods, 375 r.p.m., directly coupled to F type, direct current exciters, to supply the necessary excitation current for the above alternators at 100 volts.

Direct current is supplied by two three-phase synchronous motors, fitted with slip rings, at 380 r.p.m. on a 440 volt, 50 period circuit, directly coupled to two compound wound, continuous current generators to give 250 k.w., or 1,040 amperes, at 240 volts. This current is used for the electric locomotives, winding winch, lighting, etc.

The blast for the furnaces is supplied by four Morley's patent horizontal tandem compound engines coupled to two Conersville special smelter blowers, 48 in. by 78 in. by 96 in., and with a capacity of 36,000 cubic feet of air per minute at a pressure of 42 oz. per square inch. The converters are supplied with air by a Walker Bros.' cross compound Corliss engine, coupled in straight line with direct acting reciprocating blowers. The capacity of this plant is about 9,000 cubic feet of air per minute, at a pressure of 36 to 48 oz.

There are two air compressors in the same building for supplying power underground and to a number of pneumatically-operated hoists and other devices about the surface plant. These are also by the firm of Walker Bros., Wigan, England. The i.h.p. of each engine is 350.

The workshops and foundry are able to cope with all the ordinary requirements of a large plant. One machine worthy of mention is the Numa drill sharpener, fitted with 2¾ in. diameter Sullivan air cylinders. It will sharpen about 600 drills in 24 hours and the engineer (Mr. T. Maslin) considers it a very superior tool. Underground Ingersoll Rand drills are used.

Summary of Costs Per Ton.

Cobar Mine, 1908, 8/11.30; 1909, 8/4.08; 1910, 8/7.25; 1911, 9/5.

Smelting, 1908, 11/4.30; 1909, 9/4.10; 1910, 8/9.36; 1911, 7/5.26.

Converting, 1908, 2/2.61; 1909, 2/7.20; 1910, 1/9.24; 1911, 1/8.62.

It may safely be assumed that the figures for the current year will show a reduction on those above quoted, bringing the operating cost below 18/- per ton.

The authorized capital is £1,000,000, in 200,000 shares of £5 each; 185,000 shares are issued and fully paid, including 39,800 credited as paid. The capital was increased from £750,000 to £850,00 in July, 1910, to acquire the property of Cobar Gold Mines, Ltd., and to present amount in October, 1910, the proceeds to be applied in liquidating a portion of the debenture debt. There are £750,000 six per cent. first mortgage debentures in bonds at £20, £50, and £100 each, redeemable by drawings at 5 per cent. premium, or purchase below that rate.

PHOTOGRAPHY UNDERGROUND.

We are indebted to Mr. W. F. Ferrier for the following formula of a flash-light mixture for illuminating large stopes, etc.:

In clear weather, in the open, this light is visible at 100 kilometres and is equivalent to 20,000 candle-power. 20 seconds comb.

Powdered magnesium	20 parts.
Barium nitrate ($BaNo_3$)	30 parts.
Flowers of sulphur	4 parts.
Beef fat	7 parts.

The fat is added in melted state, and mixture cooled in zinc boxes, 10 c.m. high and 7 c.m. diameter. Weight about ½ kilo.

THE MINE CENTRE MINING DISTRICT, ONTARIO

Recently the writer visited the Mine Centre district and was much impressed by what he found there. In the old days the country was so wooded that prospecting was a very difficult proposition, but now, that the fire of two years ago stripped the country of all vegetation, every ledge and vein is visible and the prospector will have no difficulty in finding good ore outcrops, if such are in the region, as facts demonstrate there are. The region is a gold country as is well known. The ore seems to be found in ledges and veins of quartz protruding up through the Keewatin series. A small vein just west of the depot at Mine Centre, a vein not thicker than my hand, showed free gold, and almost any vein in that region, however thin, carries some gold.

This was a great mining centre in the latter part of last century. But in that time it was terribly handicapped on account of the inaccessibility of the region. There was no railroad then and all supplies had to be hauled 100 miles through an almost trackless wilderness in winter. In addition, those who opened the mines expected to find high grade ores in quantity. The Canadian Northern Railroad, having been built through the region and the improved methods by which low grade ores can be handled at a profit now make mining in the district profitable. Mining under experienced and economical management will pay in this district.

Even with the railroad running through the region, the mines are yet much handicapped, as roads are not built to the mines, or if built need to be much improved. The Foley mine is putting in a telephone line to Mine Centre and to offset its poor road the management contemplates putting in a large gasoline boat to ply on Rainy Lake between the mine and Fort Frances, Ont. Furthermore, if the road is not made passable by the Government from Mine Centre, the company will have its coal hauled by barge from Ranier to the stamp mill for fuel, instead of hauling it out from Mine Centre.

There has been an awakening in a political way recently for the benefit of this mining country. The head geologist of Canada is speaking for the region. Captain H. A. C. Machin declared recently on the floor of the Provincial Parliament that this part of Ontario rejoiced in mineral wealth. Politically, industrially and financially, a new regime promises justice and the mining of the region will take on new and vigorous life.

The increasing interest in this section is bringing miners and prospectors from all over the country to it, from Porcupine, Cobalt districts is the principal influx, but men are here even from California and Mexico. Below are some of the mines now being re-opened:—Golden Crescent, Lucky Coon, Ferguson, Old Golden Star, Calm Lake Mines, Steep Rock, Elizabeth, Olive and Foley. The last five will receive more notice.

Calm Lake.—The mines in this vicinity are owned by the Calm Lake Gold Mining Company. This company has a shaft down 85 feet. At a depth of 75 feet this shaft cuts a system of veins. At this point a crosscut of 50 feet has been made to intersect the veins and make them workable. A vein known as "No. 2" was also cut through and was found to be 50 feet wide. It showed some free gold, but not entirely a free quartz. A vein dubbed "No. 3" is also expected to be cut through soon. At the surface it is wide and shows up well. Camps were built on the ground owned by this company last summer. A steam hoisting plant is also in operation and everything is in good shape for extensive exploration and developing this summer.

The Olive Mine.—A company is preparing to reopen this mine this summer and had considerable preliminary work done when the writer visited the region. But no actual work on the mine had been done. It is one of the old, and paying mines of the old times and will need considerable overhauling.

Steep Rock.—A company composed of Thomas Rawn and associates are doing diamond drilling work on iron properties here and report has it that some very good results have been obtained. Gold prospecting is also going on in the vicinity. The writer was advised that developing work would be carried on on a large scale in this section this summer.

Elizabeth.—This is one of the old mines and was a payer. It was owned by Alan Sullivan. Considerable work was done on it, a ten-stamp mill was installed and good camp buildings erected. The mine is on Harold Lake. Mr. Sullivan had a fine log house built there for himself, had a fine fireplace built in it, had his floors covered with oriental rugs and had his walls decorated with the paintings of the old masters. But the mine failed and a Canadian bank took it to satisfy loans that had been advanced on the property. But with the coming of new life to the region, a Mr. A. McKinnon bought the mine off the bank and has been developing it during the winter. He had fifteen men employed when I visited the mine and stated that he had secured some very fine ore. More men are to be employed this summer.

The Foley.—This set of mines are located on Shoal Lake under the management of the Foley Gold Mines Company, Limited. This company intends putting in a large garden this year to offset the cost of supplying its camp. It also expects to clear more ground near it for future use in the same line. Vegetables do well in that section and fresh vegetables will help make the table more palatable. New quarters and more commodious ones are to be erected for the accommodation of the employees.

The mine is one of the old mines and has a stamp mill and other heavy machinery at hand. This, however, will need painting and overhauling. This is to be done this spring. Two years ago the engine house at the south shaft was burned and the engine much damaged. A new engine house will be erected to replace the one burned and a new boiler will be purchased soon to replace the ruined one.

A shaft will be sunk on the Lucky Joe and the old mine will be unwatered. Then some drifting to the northward on the lower level. Ores to the northward are found to be very heavy in iron sulphides. When last stamped it is reported that the iron sulphate concentrates assayed \$773 per ton. The free milling quartz ores from the vein also ran \$20 per ton per ore handled. A shaft will also be sunk on the galena vein. Ore from this vein taken in a pit 17 feet beneath the surface assayed \$30 per ton in gold, \$3.58 in silver and 5 per cent. in lead.

At the south shaft owned by the Foley Mining Company much dead work has been done. The shaft has been sunk 200 feet. From this then a cross-cut has been

driven eastward 325 feet. This cross-cut has cut four veins from five to eight feet in width and a fifth very rich vein 17 inches in width. These veins are now already for drifting and mining operations and a great tonnage of pay ore can be blocked out at a small expense of time and money.

ALASKA COAL-LAND PROBLEMS.

In the last issue we referred to a paper read for the Association of American Geographers by Mr. Alfred H. Brooks on the subject of Alaskan Coal Supplies.

In the Bulletin of the American Institute of Mining Engineers for August, Mr. H. Foster Bain contributes a paper which bears further on this subject, under the title of Alaskan Coal Land Problems. After stating that present conditions in Alaskan coal fields are extremely unsatisfactory he points out that large areas of excellent coal remain unopened within a few miles of tide water, while railways and other enterprises now import coal at a cost of from seven to nine dollars per ton on the dock. In the interior of the country the price of coal is practically prohibitory and the development of any industry requiring handling of large tonnages is impossible, except at the sea coast.

The following extracts from the paper will be of particular interest to many of our Western readers:

"Industry in Alaska always will be at a disadvantage, owing to the difficulties and expense of navigation along its coasts, and of transportation into the interior. This, however, is all the more reason why full advantage should be taken of any favourable local feature, such as abundant and excellent coal.

"In examining the matter of the opening of the Alaska coalfields, two distinct questions must be considered. The first, and more pressing, is how to get coal on the market quickly in quantities sufficient to satisfy immediate demands. The second is, what disposition shall ultimately be made of the coal lands, and under what conditions coal shall be mined in the future. Both questions involve railway problems and are complicated by existing rights of coal land locators. It is not likely that any satisfactory solution of the second problem will be found immediately. The ramifications of the matter reach such varied interests, and so many things must be taken into account, that a quick determination might well prove a wrong determination. The first problem, however, that of promptly furnishing Alaskan coal in such quantity as is really needed, seems capable of speedy and safe solution.

"Various suggestions have already been made as to how the government should proceed in case it be decided to open a government mine in Alaska. An independent commission has been proposed, but this is, I think, unnecessary and likely to prove expensive. It has also been suggested that the army be placed in charge, and the merit of this lies in the fact that the people have entire confidence in the non-political character of the army and the honesty of its officers. The excellent work, in particular, done at Panama, has greatly raised the popular respect for the Engineer Corps of the army. It is also true that to meet a similar scarcity of coal in the Philippines, the army opened a colliery there and conducted it not only ably, but in such a manner as to demonstrate the value of the coal and of the field, and this led ultimately to the opening of private mines. The army, however, has other work than mining coal, and no good purpose is served by diverting its officers from their own sphere. Aside from that, the government has in the Bureau of Mines a corps of men especially well qualified to handle this particular matter. In this bureau are all the experienced men necessary to man a colliery, from pit boss to general manager. Attracted by the opportunity for travel and study, an unusually capable and well-trained lot of engineers has joined the service. A better manager for the proposed enterprise probably could not be found than the chief mining engineer for the Bureau, who has seen extensive service in the coalfields of Colorado, Iowa, and Illinois, and has served as engineer, superintendent, general superintendent, and consulting engineer for a number of large companies. He has opened, equipped, and run a number of collieries as large or larger than any needed in Alaska, and is thoroughly familiar with coal-mining, not only in every part of the United States, but in England, Germany, and France. There are other men in the Bureau who have had valuable if not as extensive experience, and they are all men of high character, of just the sort to place in charge of a difficult enterprise. Put the matter in their hands with sufficient capital and adequate authority, and the mine will be well and honestly run.

"Since the coal is valueless unless brought to the coast, transportation problems must enter largely into any solution of the coal problem. This is true whether the government or some company mines the coal. To reach the Matanuska field, it will be necessary to take over and extend the Alaska Central Railroad. The most difficult part of the road is already built, though much money would be needed to put it into good condition. Owing to grades and curves between Seward and Knik, the line would not be easily or economically operated; and large tonnages over this division would be expensive to handle. It is proposed to establish a summer harbour at Knik, and to ship the bulk of coal from this point, to which railway transportation is easy. The line to Seward could handle quick freight and afford an emergency route for coal.

"As to the need of a trunk line to the interior of Alaska there can be no question, if the country is ever to be developed. The practical question is wholly as to means and method. Into the Behring River coalfield, the one most easily accessible, a number of surveys have been made. There are, however, only two routes that need to be considered. The first is a direct line approximately 25 miles long to Controller Bay or Katalla. This requires the making of a harbour, and any estimate of expense of shipment by this route must take this into account. Eventually one or more such lines is likely to be built, but for the present the cheapest route would seem to be the longer one to Cordova. This requires a road from the mines almost to Katalla, then north to a junction with the Copper River & Northwestern Railroad. The distance is longer, 58 miles, but of the total, 33 miles form part of the main line of the road already built, and the cost of an extra harbour is avoided. This is the more feasible route for the present. It would have the advantage of permitting through shipment to the copper mines of the interior, while the other would re-

quire transfer to boats at Katalla and retransfer to cars at Cordova.

"The problems that now confront our bituminous coal mining industry arose a few years ago in the same form in Germany. In that land of orderly industry, the coal business was in as bad condition as was ever that of Pennsylvania or any other American State. There was this difference: the Prussian government, as the owner of many miles of railroad, was concerned, in place of, as in America, a group of private individuals; but, further, the government there did not, as here, own a large part of the known coal. Difficulties in railroad operation, as well as the general disorganization of industry, focused public attention on the coal industry. The State railways sometimes enjoyed cheap coal, and at other times paid dearly for it. At times the lines had much traffic, and at other times little. For short periods the collieries made large profits, and these periods were succeeded by long lean years. The methodical Germans studied the situation, and then met it in a practical manner, undeterred by theoretical considerations of what might happen. The government purchased enough mines to give it control of approximately 40 per cent. of the coal-producing capacity of the country. Then, on the basis of the ownership of these mines and a thorough knowledge of the business, the government joined in a syndicate for mining and marketing coal. While there has been some criticism of the results, there has been steady work, moderate but regular profits, and better prices. English coal companies, it is true, have made inroads on the Berlin market, but the Germans gaze with equanimity upon this. They regard the low-priced coal furnished by competing English companies as just so much gain. Germany has regulated the coal monopoly by becoming a party to it.

"In Alaska it is extremely difficult to successfully develop an enterprise, and only the most efficient form of organization can hope for more than sporadic success. The coalfields may be developed more quickly, economically, and efficiently by a single great syndicate than by a number of small warring concerns. The first step in the solution of the Alaskan coal land problems should be the opening of a government mine, primarily to supply the government needs of coal. If necessary, the government should build the needed railway to the mine. The second step should be the opening of private collieries on leased ground, and the formation of a selling syndicate to pro-rate all contracts. The government itself should be a member of this syndicate and should be represented in its management by an expert resident official of ample authority. If any of the present claimants of lands succeed in getting patents, they should be invited to become participants in the syndicate, and they would probably find it greatly to their advantage to join.

The immediate thing is to provide for mining some coal now and still leave the policy of the future to be shaped to meet its own needs. This seems to be to be most easily accomplished by following the opening of the government mine with an offer of a limited number of leases to any one who may care to undertake the risks involved in opening collieries in Alaska. These risks, from a business point of view, are bound to be large for many years, and the government in offering a lease should be prepared to safeguard in every reasonable way the lessees as well as the public.

"Leases should be granted upon liberal terms, fixed in advance, should run for a period of preferably 25 years, and should cover in each case sufficient area to permit continuous operation of a modern plant through the life of the lease.

"All applications for leases should be accompanied by bond, and after two years within which to open the mine, royalties should be collected for the proportionate tonnage of each year whether coal be mined or not. Such royalties should apply on future production, their payment being merely required to prevent indefinite suspension of operation. The detailed terms of the suggested leases might profitably be varied somewhat, but the following general principles should be held to (1) Terms liberal and known in advance; (2) all companies to participate in sales and contracts; (3) the government to be fully informed of all details; (4) the government to be in position to prevent extortion by permitting the opening of additional mines; (5) royalties to be determined by the companies themselves by means of competitive bidding; (6) revenue over and above the cost of maintaining the service should go in large part, if not entirely, to the local Territorial government; (7) leases should be freely transferable, and subject to cancellation only for material failure to observe their terms and after court review.

SHERBROOKE AS A MINING CENTRE.

(By Charles E. Bradford, Secretary Sherbrooke Board of Trade.)

The Eastern Townships, of which Sherbrooke is the centre, plays a prominent part in the mining interests of the province. The growth of the mineral industry can but be shown by the values of mineral production, which was as follows: 1911, \$8,567,143; 1900, 2,546,076. Over half of this amount is produced in the Eastern Townships.

Among the minerals to be found here are asbestos, gold, silver, copper, granite and marble deposits. There is a great need at this time for a customs smelter, and Sherbrooke would be the logical location for such an industry. In the Sherbrooke district there are nearly 70 known copper properties, which cannot be profitably developed until such a smelter is established. The larger mines will, no doubt, be successfully operated, as heretofore, but individual owners will not be mined until proper smelting accommodations are produced.

Many of these properties are very promising, and there is little doubt that many of them would develop paying mines.

While mining is in its infancy in the Eastern Townships, the outlook is very encouraging, and undoubtedly the outcome will justify the hopes of the most sanguine.

In connection with the establishment of a customs smelter, or other industries, the City of Sherbrooke is, of course, advantageously located for such enterprises. Aside from its natural advantages namely, proximity to raw materials, railway facilities, price of power, labour market, living conditions, and general outlook, the general optimism and energy of its citizens, makes it appeal at once to the man who is on the lookout for a good factory location. The recent activities of the Sherbrooke Board of Trade have attracted considerable attention, and their willingness to co-operate in any way possible with prospective manufacturers is commendable. The latch string hangs out and the invitations is extended to you.

WEST SHINING TREE GOLD DISTRICT*

This district is situated near the western edge of the 'emagami forest reserve, and is limited by the boundries of the townships of Asquith, Churchill, Macıurchy, and Fawcett. It adjoins the Gowganda disrict on the east and is some 55 miles south of the Porcupine district. The nearest railway point is Ruel, 72 niles distance from Sudbury, and from this point a trail eads to the district. Topographically, Shining Tree lifers little from other mining districts in northern Onario. The predominant rocks of the district are Laurenian and Keewatin age respectively. The Laurentian is epresented by granites, gneisses and granite-porphyies. The Keewatin is present over the greater part of he four townships in the form of rhyolite, quartz porphyry, amphibolite and andesite with metamorphic ariations of these rocks. The metamorphic rocks are nostly greenstone schists. The andesite is the commercilly important formation, for associated with it are all he gold showings of the district. Only in a few places loes the andesite occur unaltered, appearing generally is a schist.

In the Shining Tree district there are two of these ndesite areas, one about West Shining Tree Lake, and he other, seemingly smaller, to the east and north in the ownship of Macmurchy. There is little difference beween these two areas except, perhaps, that the small veins seem to predominate in the smaller area, which is mown locally as Wasapika. In both areas the quartz is plainly a derivative of the schists with which it occurs und into which it grades in many places.

There are two types of quartz bodies in the district, large irregular masses with indefinite and poorly defined walls and small veins of proportionally greater length, but which resemble the larger bodies insomuch as they have splintery walls with stringers of quartz running off and disappearing into the wall material. One vein of this type seemed to be about 20 ft. wide with a strike which could be definitely determined along the straight edge of the northern side of the vein. Upon breaking into the surface of the quartz it developed that the quartz was but 2 ft. wide and had "flowed" over the foot wall at surface. The quartz in the "overflow" portion of the vein was decidedly brecciated.

The author states that: "It is improbable that Shining Tree will be of commercial importance in the immediate future. The gold, while it is present on many claims in the district, is not concentrated in quantities which would pay for working. The rich pockets are few and small, and so far the prospecting of the district has been slow and inadequate. There is a tendency on the part of the prospectors to require abnormally large 'first payments' on options for small showings. Most of the claims have received little attention beyond a desultory trench here and there. The only serious attempt at thorough exploration was made by Victor Rakowsky, of Duluth, on the Gosselin claims. The heavy timber of the country prevents easy prospecting and requires considerable work with the axe before the pick and shovel can be used. Could the prospectors be persuaded to go below the surface on a small scale, the district might afford a good berth for a small ore-buying company."

CORRESPONDENCE

THE SLIP PALPABLE

Editor Canadian Mining Journal:

Sir,—The Canadian Mining Journal of August 15 has just reached me. Your correspondent, Alex. Gray, states that "'E. J.' avails of a palpable slip, to intimate that Mother Lode, Sheep Creek, recovery per ton is in doubt." May I suggest that a "palpable slip" should not be expected in the case of such a practised writer as is Mr. Gray, especially as he appears to look for readers of mining journals taking him as an authority on matters he writes about. It is bad enough for common-place correspondents like "E. J." to occasionally make a "palpable slip," but surely such a big gun as Mr. Gray should not do so. However, let me quote Mr. Gray's statements, and a paragraph recently printed in the Toronto Globe, and then readers of the Journal may try to unravel the tangle for themselves:

(1) Alex. Gray, in The Mining Journal, London, May 25:

"The mill of the Mother Lode mine started crushing on May 6. . . . The 10-stamp mill is rated at a daily capacity of 70 tons, and assuming a recovery of $14 a ton and averaging 26 working days, a net profit of $25,000 per month is expected."

(My comment on this statement was: "It should be added that if Mr. Gray is correct in the statement that a recovery of $14 a ton is expected, he appears to have omitted working costs when calculating expected net profits.—E. J.")

(2) Alex. Gray in Canadian Mining Journal, August 15:

"My calculation that a monthly profit of $25,000 would Probably be earned, was based upon the assay plans of Mr. Watson and the milling returns on several shipments to smelters. A net recovery—and the 'net' was inadvertently omitted from what appeared in The Mining Journal of London—of $14 per ton, is what is expected. This allows for working costs of $7 per ton. So that, whatever the contrary view may be, it is beyond question that the Mother Lode ore developed is expected to yield a per ton profit of $14. With low power costs and a very high extraction, there is no reason to doubt a profit of 66 per cent. on the gold contents being recovered."

(3) News item in Toronto Globe, August 13:

"The Mother Lode gold mine of Sheep Creek, British Columbia, owned largely by Mr. John McMartin, had its first monthly clean-up for July. Although there are minor details yet to be perfected before the management attains to the fullest possible crushing capacity, during July the mill ran 29½ days and crushed 1,860 tons, the average daily milling total being 60 tons. The average value per ton milled was $17.28, from which an extraction of 97.98 per cent. of the gold content was obtained. The gross value of the ore milled was $31,497. The operating expenses amounted to $12,210, so the net profit was $19,287. The working costs per ton include milling and mining charges. These costs amounted to $6.56 per ton milled. The profit for July is at the rate of 18.5 per cent. on the capital of the Mother Lode Company."

*Abstract of an article contributed by W. R. Hodge to the Engineering and Mining Journal

In the foregoing the average value per ton milled ($17.28) does not work out to the total gross value stated. A comparison of Mr. Gray's several expectations with the stated results as published in the Globe suggest over-sanguineness on his part. The profits—or rather, the difference between the value per ton shown to have been recovered and the mining and milling costs appears to have been, for July, $10.37 per ton. There is nothing to indicate what the general expenses, other than mining and milling costs, were per ton, consequently the final net profits, available for distribution to shareholders, should such a course be deemed advisable, do not appear to be shown. The suggested profit at the rate of 18.5 per cent. assumes similar figures—days run, quantity crushed, average value of ore, and average "very high extraction"—the year through. Such expectations may or may not be realized, but if they shall be the Mother Lode Company will be unique in its experience in a country where severe weather is usual in the depth of winter.

I should like to add that when in the interior of this province a few weeks ago, I wrote to Mr. Wm. Watson, in his capacity as resident manager of the Mother Lode Sheep Creek Mining Company, requesting him to be good enough to give me some information as to operations and results, but seemingly he did not show me the most ordinary courtesy of a reply, for no communication from him has yet reached me. In this respect the Mother Lode Company is almost alone, for few, if any, mining companies of good standing operating in British Columbia ignore my courteously worded applications for information—either they give me notes of what they are doing, or they reply that, for reasons deemed sufficient, they may not do so. Information about the Mother Lode property has reached me from other sources during quite recent months, and it is not so favourable as either that given me last year by the manager or has since been supplied for publication from sources that, on the face of it, do not appear entirely disinterested. Of course it is for the management of the Mother Lode Company to say to whom they will supply information, but I may state as my experience, as the accredited correspondent of half a dozen influential mining publications, that when my request for information have been ignored it has sometimes transpired that the operators concerned "had no use" for a correspondent who would publish only facts. Repeatedly lately the question has been put to me as to whether the Mother Lode Sheep Creek people have not been trying to create a market for their stock, but since I am not concerned whether anyone is trying to "unload" or not—only seek particulars as to operations, production, and other information connected with the industrial side of mining. I do not pretend to know anything about stock market affairs.

That there may not be even the slightest misconception as to my position in regard to the Mother Lode and some other Sheep Creek mines, I will state that I have information from a number of men I think reliable, who agree as to the general merit of Sheep Creek mines and the favourable outlook for profitable production from them. More than that, it may not be expected I shall commit myself to in the case of properties concerning which information as to progress and results is withheld from me by those in charge.

Perhaps the Mother Lode management may yet exclaim, "Save us from our friends," when said friends lack accuracy in their published statements.

E. JACOBS.

Victoria, B.C., August 23, 1912.

PERSONAL AND GENERAL

Mr. F. P. Jones, general manager of the Cement Corporation, has left for the West on the company's affairs.

We are glad to note that Prof. F. H. Sexton, director of the Technical College at Halifax, who has been seriously ill, is now convalescent.

Mr. A. J. McMillan, formerly general manager of the Le Roi mine, at Rossland, has returned to British Columbia from Scotland.

Dr. J. M. Bell, formerly director of the New Zealand Geological Survey, but now engaged in consulting practice in London, purposes visiting Canada shortly at the request of a syndicate interested in gold properties in the Porcupine District.

The many Canadian friends of Mr. Walter Johnson, who, it will be remembered represented the Iron and Steel Institute on the occasion of the Canadian Mining Institute's transcontinental excursion in 1908, will regret to learn of his misfortune in the loss by fire of his beautiful residence at North Allerton, in Yorkshire. The house was an exceptionally fine example of early eighteenth century architecture and the interior decorations had been designed and executed by Adams.

Mr. H. P. De Pencier, consulting mining engineer of Montreal, has been ill with pneumonia, but is now convalescent.

Mr. D. J. Arthur Rees, of Porcupine, has been offered a permanent post in the British civil service.

Mr. H. C. C. Bellinger, well known to our Western readers by reason of his association first with the Northport and later with the Crofton smelter, has been elected president of the Australasian Institute of Mining Engineers. Mr. Bellinger, who has been in Australia for three and a half years, was first in charge of smelting operations at, and is now general manager of the Great Cobar mines, which, he stated had since they were first worked produced 3,000,000 tons of ore, and given the world 100,000 tons of copper worth approximately $35,000,000. He believed that the Great Cobar would produce 10,000 tons of copper a year, 50,000 ounces of gold, and nearly 250,000 ounces of silver.

Mr. George E. Drummond has returned to Montreal from abroad.

Dr. A. E. Barlow, president of the Canadian Mining Institute, left Montreal for British Columbia on Aug. 18th. His intention is to visit a number of the mining centres in West Kootenay and elsewhere before proceeding to the Coast. He will preside at the Western meeting of the Institute in Victoria on September 18th and 19th, and also at a meeting to be held at Frank, Alta., on September 30th.

Mr. W. L. Coulson, general manager of the Canadian Collieries, Ltd., when in Vancouver recently, stated in an interview that important improvements in connection with the development and equipment of the col-

ieries at Comox are now in progress. It is expected hat early next year power will be delivered from the plant now being installed at Pundlege River, and thus enable the company to double its present output. A new colliery, known as No. 8 is being opened near Cumberland, borings having determined the seams at a depth of 900 feet. The present demand for Vancouver sland coal is exceptionally heavy.

Mr. J. M. Mackie, managing director of the Hillcrest Collieries, states that excellent progress is being made n the installation of new equipment at the mines. Meanwhile an output of between 600 and 700 tons a day s being maintained, and prices are higher and the demand for coal greater than at any previous time.

Mr. T. J. Drummond, president of the Lake Superior Corporation, in announcing the appointment of Mr. Samuel Hale to the general managership of the Algoma Steel Corporation, has issued the following statement: 'In pursuance of its policy and the separate financing and operating of its chief subsidiary companies, the executive of the Lake Superior Corporation has decided to place an independent general manager over the plant and operations of the Algoma Steel Corporation, of Sault Ste. Marie. The Steel Corporation was recently organized combining several of the subsidiary companies of the Lake Superior Corporation, including the Algoma Steel Company, the Lake Superior Iron & Steel Company, the Lake Superior Power Company, etc.''

Mr. W. Bennett is superintendent at the McAllister mine, Slocan District, B.C., at which work was resumed lately after inactivity for several months.

Mr. J. C. Buchanan, general manager of the Hobson Silver-Lead Company, Ltd., has returned to Ymir, B.C., from a visit to Fort Worth, Texas.

Mr. Chas. Camsell, of the Geological Survey, Ottawa, has been in Victoria, B.C., obtaining information for use when the delegates to the International Geological Congress shall visit British Columbia next year.

Mr. Howells Frechette, of the Mines Branch, Canada Department of Mines, was in the coast cities of British Columbia last month.

Mr. Thos. French, of Glasgow, Scotland, son of Mr. A. Gordon French, is at Nelson, B.C., investigating the matter of the occurrence of metals of the platinum group in ore and dike material at the Granite-Poorman mines of the Kootenay Gold Mines, Ltd., which occurrence his father claims to have discovered.

Mr. A. H. Gracey has returned to Nelson, B.C., from a visit to the Rose Marie mine, on the west coast of Vancouver Island, where about a dozen years ago a quartz vein mineralized with iron pyrites containing fair value in gold, was opened, and a small stamp mill and concentrating plant put in.

Mr. C. Hanckel, formerly with the Zinc Corporation, Ltd., at Broken Hill, New South Wales, Australia, is now in Silverton camp, near Slocan Lake, B.C., engaged in preparing plans for a concentrating mill for the Silverton Mines, Limited, which owns the Hewitt-Lorna Doone group silver-lead-zinc mine, in connection with the concentration of the ores of which it is intended to use a flotation process for the recovery of part of the silver-zinc contents of the ore following the extraction of silver-lead by ordinary water concentration.

Mr. Leslie Hill, who for about 20 years has been directing the development of mining properties in British Columbia and Southwest Alberta, is giving up his mining engineering work, and removing from Nelson to Vernon, Okanagan district, British Columbia, where he has a ranch that will in future engage his attention.

Mr. Lionel Hill, of Rossland, B.C., assistant to the manager of the Le Roi No. 2, Ltd., is spending a couple of months' holiday vacation in the Province of Quebec.

Capt. Harry Johns, one of the British Columbia Copper Company's mine superintendents, has returned to Greenwood, B.C., from examining a mining property in Montana for that company. During the first part of August he visited the L. H. mine in Slocan Lake District, B.C., being developed by the B. C. Copper Company under option of purchase.

Mr. Anthony J. McMillan, liquidator of the Le Roi Mining Company, after having spent several weeks in British Columbia, is returning to England.

Mr. C. K. Milbourne, of London, Eng., a director of the British Columbia (Phoenix) Syndicate, has been visiting several mining properties in British Columbia his company is interested in.

Mr. R. Roberts, manager of the Jewel mine and stamp mill, in Boundary District, has been burned on the hand and foot as a result of going too close to the high voltage electric power apparatus in the substation at the mill. While in the Greenwood hospital, he is not very seriously injured.

Mr. W. Hittell Sherzer, geologist of Ypsilanti, Mich., U. S., has been spending several weeks on the Soho group of mineral claims, in Slocan District, B.C.

Mr. Clyde B. White, son of Mr. Oscar V. White, superintendent of the Slocan Star mine, near Sandon, Slocan, B.C., has been engaged for the past few months in mining engineering work in Slocan district, after having been for several years with the Arizona Copper Company, Arizona, U.S.A.

Mr. Byron White, of Spokane, Washington, for many years actively associated with mining operations in Slocan district, British Columbia, recently went up to Whitehorse copper camp, in Southern Yukon, where he has copper mining property.

Mr. John E. Hooson, for years mining recorder at Rossland, B.C., received a valedictory address and presentation on his leaving Rossland for Fort Fraser, in the central part of British Columbia, where he will be Provincial Government agent.

Mr. Jos. Keele, of the Geological Survey of Canada, is now investigating the clay deposits in the Province of Quebec and is now in the field.

Mr. P. L. Naismith, formerly of Lethbridge, Alta., has joined the staff of the Canadian Pacific Department of Natural Resources at Calgary.

The engagement is announced of Dr. Herman Wupperman, of Pineberg, Germany, to Fraulein Erna Witzel, of Dusseldorf. Dr. Wupperman, it will be remembered, was one of the German representatives on the occasion of the Canadian Mining Institute's transcontinental excursion in 1908, and was an extremely popular member of the party.

Mr. C. K. Milbourne, of London, formerly connected with the Ymir and other important British directed mining undertakings in British Columbia, is again in Canada and proposes spending some weeks in British Columbia before proceeding to Mexico.

Mr. Alexander Foulds, of Vancouver, B.C., has left for Grahame Island, where he will remain for the next two months.

Mr. Victor A. Hills, formerly of Moose River Gold Mines, Nova Scotia, is now established at Denver, Col. He is at present in the Yukon on professional business.

Mr. Thomas Russell has resigned from the position of superintendent of Extension mines at Ladysmith, B.C., and has been succeeded by Mr. J. H. Cunningham, resident engineer of the mines for the past two years.

Mr. R. B. Lamb has returned to Toronto after an absence of some five weeks in London and Paris.

Mr. A. J. McMillan, of Rossland, sailed last week for Europe.

Mr. H. McCarther has resigned the management of the Minudie Colliery, N.S., to accept a managerial appointment in Western Canada.

Mr. Frank C. Loring, of Toronto, was in London recently.

Mr. Charles Fergie has returned to Montreal from Halifax.

Mr. W. H. Trewartha-James has sailed for Nigeria.

Mr. C. P. Hill has returned to Montreal from Europe where he spent the last three months.

Mr. B. A. C. Craig has returned from the Pacific Coast and is about to visit Winnipegosis.

Mr. William Smith, manager of the Bell Asbestos mines, at Thetford, Que., leaves this week to assume new duties with the same company at Ambler. On the 30th ultimo Mr. Smith was entertained at a farewell dinner by the Eastern Townships branch of the Canadian Mining Institute, of which he has been the secretary since its organization some two years ago.

Mr. Thos. Hale has been appointed mine manager of the Drummond Colliery.

Mr. G. W. Evans, mining engineer, of Seattle, Wash., is making an examination in the Ground Hog coal field, in northern British Columbia.

Mr. Samuel Hale, formerly vice-president and general manager of the Wisconsin Steel Company, has been appointed general manager of the Algoma Steel Corporation, Limited. Mr. Hale has been associated with the steel industry since 1893. He was first employed by the Illinois Steel Company, serving in various capacities until 1899, when he was appointed assistant general superintendent; while for the past ten years he has been associated with the International Harvester Company, whose steel works were organized as the Wisconsin Steel Company.

Mr. E. P. Earle, president of the Nipissing Mines Co., has been elected a director of the Tri-Bullion Smelting and Development Co.

Mr. C. H. Poirier, who recently resigned as engineer and manager of the Porcupine Gold Mines (Vipond) Co., will return to the headquarters of his firm, Poillon & Poirier, in New York. It is understood that Mr. Poirier will continue to give his services to the Vipond Company, as consulting engineer.

Mr. W. A. Begg is assistant City Engineer in Regina. He was well-known in Cobalt and Porcupine during the early days.

Mr. G. S. Scott has returned from a trip of inspection in eastern Ontario.

Mr. C. L. Bryden, mining engineer, 1015 Myrtle Street, Scranton, is organizing an American Association of Old Freibergers. Those who have not been notified are requested to send in their addresses to him.

Sir Charles Hunter, the Earl of Stanhope, and the Earl of Winterton, together with about 20 other British financiers interested in the Lake Superior Corporation, will arrive at Montreal on August 23rd for a trip to the Sault and Western Canada. The Canadian Agency, Limited, of London, is conducting the excursion.

The Canadian Mining Journal has been fortunate indeed in securing for its Special Cobalt Issue an article by Dr. W. G. Miller. The leading article in the first number of the Journal, published on March 1st, 1907, was from the same pen and dealt with the same subject. At that time the Canadian Mining Review had just been absorbed by this publication. Cobalt had not attained fame. It had achieved notoriety. Dr. Miller's article was a sane and guarded presentation of facts. Nothing could be more instinctive than to compare that article with Dr. Miller's present contribution to our columns.

The right use of English is receiving more and more attention in our mining schools. The argot of the mining camp is a strange mixture of colloquialisms, localisms, and slang. Not a few illegitimate phrases are crisp and apt; and these are likely to survive, to become legitimized, and to be incorporated in the language. Many mining phrases, however, are shockingly uncouth, inexact, and redundant. They do not deserve to live. The student must be taught to discriminate. He must also be taught to express himself in sound, clear English. At the Colorado School of Mines, Dr. Victor C. Alderson is striving to impress this upon his pupils. With this object in view he has compiled a series of notes giving the correct and the incorrect uses of many words that are troublesome to the beginner. A few of these are reproduced on another page of this issue.

In the Alaska-Treadwell mill, one pound of chrome steel in the shoes crushed, on the average, 2.73 tons of ore in a year; while one pound of iron and steel in the dies crushed 4.19 tons.

As an instance of the conservation of fuel by the use of gas producers, it is stated that the United States Steel Corporation by the installation of blast-furnace gas engines to displace the former equipment, saves approximately 1,000,000 tons of coal per annum. The great saving in fuel obtained through the gas producer has led to the installation within the last decade of several hundred of such power plants throughout the United States. Again as a smoke preventer, the gas producer is one of the most efficient devices on the market. It reduces the fuel consumption not 10 or 15 per cent., the limit of the ordinary smoke-preventing device used in steam plants, but from 50 to 60 per cent.

The dividends distributed by seventeen Canadian metal mines during the first six months, ending July 31st, of the present year, aggregate the very respectable sum of $5,981,877. The mines in question have paid since incorporation $38,230,113, or a return equivalent to 69 per cent. on their outstanding capital.

Discussing the relation and value of geology to mining, Mr. W. H. Weed very fittingly points out that "the use of geologic work to commercial ends is not, as many geologists formerly held, a prostitution of science to commercialism, but a successful proof of the usefulness of the science." He adds: It is a well recognized fact that governmental surveys of mining districts are made because an investigation by a well trained expert is not only useful to the local mining operators, but of general value to the mining fraternity throughout the world. He does not agree with those who expect the

government geologist to outline new development work or to predict "strikes" in any particular area, maintaining that the function of the official investigator should be confined to indicating the value of surface evidences, and by careful consideration of the facts, structural and mineralogical, to diagnose conditions, "even as a consulting physician called in by the ordinary practitioner in a difficult case, carefully considers the symptoms, and gives an opinion." In Canada, geology has proved of incalculable aid to mining, and of late, in particular, the services of geologists in consulting practice have been in great demand, but as an eminent member of the profession recently observed: "The trouble too frequently is that the doctor is called in too late, and in quite a majority of cases he finds that instead of being required to assist at a birth, his duty is to sit on a corpse."

The Republic district, in Ferry County, in the State of Washington, in the mines of which much Canadian capital was at one time invested and lost, has not ceased to be productive and appears, in fact, to be going through a process of rehabilitation. Thus in 1911 it produced gold and silver to the value of $869,108, or over 82 per cent. of the total value of the metal output of the State of Washington for that year. The difficulty heretofore in Republic has been in the character rather than in any lack as regards the quantity or quality of the ore; and if the problem of treatment has been successfully solved there is no reason why the camp should not yield importantly for some years to come.

With the dividend recently declared by the Coniagas mines, at Cobalt, the aggregate distribution to shareholders represents 95 per cent. of the company's capital. Several of the Cobalt mines have now returned their capital to shareholders, and it may be confidently asserted that for the number of profit-earning mines within a limited area there is no other mining camp in the world comparable with the Cobalt district.

The Scandinavian correspondent of the "Mining Journal" states that a Spanish conosrtium of financiers has recently inspected the nitrate works at Notodden, Norway, with a view to the adoption of Norwegian synthetic methods in works it is proposed to establish in Barcelona and in Montreal, and a Spanish and Canadian company will be organized with this object in view.

THE C. M. J. STUDENTS' PRIZE.

Soon the mining students will be returning to the fold for the autumn and winter sessions. We beg to remind them that the Canadian Mining Journal offers a substantial prize (see our issue of April 1st.) for the best paper, dealing with any mining, engineering, or metallurgical subject. The sooner these papers are submitted the better.

COMPANY NOTES

NIPISSING MINES CO.—The seventh annual report of the Nipissing Mines Company for the past year is eminently gratifying. Thus during the 12 months 29,146 tons of ore was shipped, assaying from 273 to 2,393 oz. silver per ton, yielding a total of 4,678,074 oz., worth $2,506,608. The average price received per ounce was 53.58c. For 2,356 lb. of cobalt sold, $589 was realized. Freight, treatment, and smelter deductions totaled $125,484, which left a net value received of $2,381,712. The total cost of producing silver, based on an output of 5,197,042 oz., which was contained in the shipments and ore on hand amounted to 13.95c. per ounce. There was on hand at the end of 1910 ore amounting to 185 tons, and at the end of 1911, 268 tons; so with the shipments during the latter year, the mine production totaled 2,992.39 tons, containing 5,197,042 oz. silver, with a gross value of $2,820,257. The total profit on production was $2,095,241. The shipments from 1904 to the end of 1911 amounted to 24,475 tons, valued at $12,939,395. Dividends for the year were $1,838,430, making $7,850,930 in all. Twelve veins contributed to the past year's output, No. 7, 80, and yielding 3,142,198 oz. A new hydraulic equipment, for surface prospecting, was fitted up. A force of 25 men completed 13.7 miles of trenches 2.7 feet deep. In the diabase, east of the lake, No. 149 vein was found to contain high-grade ore. Of the 846 acres held, 576 are partly prospected, and 270 unprospected. A total of 8,781 feet of development, and 13,841 cu. yards of stoping was done. The year's work on vein No. 73 has been most favourable, and on the 247-ft. level it has been opened for 200 ft., the average width being 4 inches. A fault disturbed veins 80 and 100, between the 70 and 189-ft. levels, but they have been picked up again. Vein 64 is the strongest on the property, and has been developed on five levels to 344 ft. deep and 900 ft. long. Vein 122 did not realize expectations; but 63, 108, and 148 produced heavily, although the high-grade ore in them is nearly exhausted. The reserves consist of 7 veins containing 3,454 tons of ore with 6,126,838 oz., and 80,036 tons on the dump, with 1,756,954 oz. silver.

ALASKA TREADWELL.—The report of this company just issued covers a period of 19 months to December 31st, and during this period 15,533 ft. of development was done on eight levels, making a total of 122,563 ft. for the past 18 years. During the nineteen months 1,349,264 tons of ore was extracted from the 750, 1050, 1250, 1450 ft. level stopes, and development on 750, 900, 1050, 1250, 1450, 1600 and 1750 ft. levels. The ore reserves totaled 7,613,087 tons, made up of 6,344,749 tons in place, and 1,268,338 tons broken in stopes. The average of 6,193 samples from the mine was $3.32 per ton. The 240-stamp mill crushed 633,976 tons, with a duty of 4.64 tons per stamp, and the 300-stamp mill 715,288 tons, equal to 5.44 tons each. Both mills produced 24,952 tons of concentrate, of which 17,751 tons was treated at the mine by cyanide. The total yield from 1,349,264 tons milled and concentrate treated was $3,259,446. Dividends paid amounted to $800,000. The yield per ton milled was $2.41, and costs totaled $1.43 per ton. The report, which covers 74 pages, and several mine plans, is a creditable production and leaves nothing to be desired.

THE SOUTH BELT AT ROSSLAND, B.C.

Mr. J. L. Warner, in an article published in the Nelson Daily News, writes interestingly on the changes that have taken place in the Rossland district since he first knew it in 1893. The camp then, he remarks, had few champions except the prospector. The Columbia River steamer stopped at Trail, and Rossland was only accessible by wagon-road. The nearest smelters were at Butte, Montana and Tacoma. The difficulties of accurate sampling, since there were no facilities for test-

ing large lots, were necessarily great and the results were so varied that capital was slow to interest itself in the district. The old smelting rate was $23.50 per ton as compared with the present charge of $4 for freight and treatment. The progress that has been made is largely attributable to the operations of the Consolidated Mining and Smelting Company, at whose smelter at Trail all the ore produced in the camp is now treated. At many of the mines depths of nearly half a mile have been attained, while there are fifty miles of underground workings. Among other changes, the almost universal adoption of diamond drilling as a means of exploration is noted, as also the fact that electric power has almost displaced steam except for hoisting purposes. Meanwhile the camp has produced gold and copper to the value of over fifty-two million dollars. Mr. Warner believes that the chances of developing new mines in the South Belt are very favourable, and states that he is convinced from results attending recent exploratory work in which he was engaged, that the formations are identical in character with those on Red Mountain. The same dikes cross the series of parallel veins in both belts, but the greater depth of decomposed surface rocks makes exploration of veins on the surface more difficult in the South Belt. There is evidence that the pervailing galena ores in the surface exposures will give place to copper-gold ores at depth.

SLOCAN CITY MINING DIVISION

Written for The Canadian Mining Journal by E. Jacobs.

There appears to be a gradual increase in activity in mining in Slocan City mining division, although there are still comparatively few of the properties being worked.

LILY B.—The most notable operations at present being carried on are those at the Lily B. mine, situated in the vicinity of Springer Creek. The shaft, now down about 198 feet, has been sunk on the vein which inclines at 60 to 65 degrees. A level is being opened at 190 feet depth, preparatory to drifting on the vein, which is about 12 feet in width. A cross-cut of 8 feet to the hanging wall makes a small station giving room to turn an ore car and dump into the skip. The ore is described as being generally a "dry" ore, though occasionally as much as 65 per cent. lead ore is found. The gangue is an altered granite filling with some quartz, the latter varying up to 4 feet in thickness. Next to the hanging wall there is a paystreak of high grade ore containing gold, argentite, and native silver; this had been 12 in. wide, and then it pinched. Recently, though, it has come in again, and at the time the information was obtained there was 6 in. of this ore in the face of the drift. There is another paystreak towards the footwall, but this has not yet been mined. Drifting was commenced on August 11, so there has not yet been time to get out much ore. That taken out is good-looking ore, and profitable returns from the smeltery are expected after shipment shall have been made. A Sullivan large-size machine drill has lately been put in, this is being operated by steam, it takes the place of a smaller drill previously used for some time.

The Lily B. group includes four claims, namely, the Lily B., Portland, Rainbow, and Rainbow fraction, located by G. D. Long, N. S. Tucker and partners. Mr. Long is superintendent for the Lily B. Mines Company, Ltd., of Spokane, of which company R. Mabry is president. The vein runs through all four claims, it has been opened near the surface in cuts, prospect shafts and tunnels at intervals along a distance of about 2,000 feet. Ore shows in a number of these openings. The mine buildings include a cookhouse about 20x40 feet, substantially built of logs, and a really good structure; an old bunkhouse, about 20 ft. square; and an engine house, about 30x40 ft., in which are a hoisting engine and other plant, blacksmith forge and tools, etc. It is intended to shortly erect a new bunkhouse, and office building, and to provide other necessary accommodation. The number of men employed on the property recently was twelve.

The Provincial Government is making a road from the hotel on the old Arlington road to the Lily B. mine, a distance of about 6,000 feet, and eighteen men are engaged in this work. This will save a mile in distance, giving a direct road and better hauling than at present. The company will build an orehouse near the new road as soon as the latter shall have been completed.

METEOR.—The Meteor is under lease and bond to Chas. E. Barber, who has two partners. The lease has about another year to run. Six men are working on the property, from which one car of high-grade ore was shipped about the end of last year, and another a few weeks ago, while some 20 tons is now ready for the packers to take down to Slocan City. The first-mentioned car is stated to have contained about 20 tons of ore from which a net return of about $7,000 was received from the smeltery, while the second lot, of about 28 tons, is said to have brought the company between $9,000 and $10,000. More ore is in sight, and the lessee is busy making the most of the unexpired time of his lease. Some beautiful specimens of Meteor ore were seen at the Madden House, Slocan City, these containing much free gold and native silver.

OTHER PROPERTIES.—Of the numerous other well-known properties in the Springer Creek section of Slocan City division, but few are being worked. Included in the list of inactive ones are the Ottawa and Arlington, but it is thought probable some work will shortly be done in the latter, although nothing definite in this connection could be learned.

On Zimmerman's claim near the Ottawa, the owner is working alone, and in July he sent out a few tons of ore. Two men have been working on the Black Prince for about two years, during which period between 800 and 900 feet of tunnel has been driven. A later report was to the effect that a little ore was showing in the face, so that the outlook is regarded as promising. The Hampton is the property from which M. Cameron last year shipped 2,100 lbs. of ore that re-

turned $365 net. This is one of the mines in which the late N. S. McNaught was interested; it is known that there is more ore in it, but considerable development work will have to be done before much can be extracted.

ABOUT LEMON CREEK.—This is another of the N. S. McNaught properties; it is now under lease and bond to Mr. Sostedt, who is stated to be working four men. The information obtained in Slocan City—not from the lessee, though—is that it is intended to treat the ore at the old Chapleau mill, from which to the Kilo, a distance of about two miles, the government is making a wagon road. Some 20 to 25 men have been working on this road and in repairing the old road from the mill to the Slocan-Nelson railway, for about six weeks, and it is expected it will be completed this fall, so as to allow of ore being hauled over it from mine to mill.

Particulars of the Kilo property were not obtainable, other than the following taken from an official report dated 1899: "The Kilo group, consisting of 22 claims, is being opened by driving tunnels on the ledge, and very encouraging results have been obtained. The character of the ore is quartz containing iron pyrites, the value being in gold."

The Rose Marie Mine.

Last month Mr. A. H. Gracey, mining engineer, of Nelson, made a trip up the west coast of Vancouver Island to the Rose Marie mine, in Clayoquot mining division, which mine he examined and sampled. The following information relative to this property has been taken from a report made in 1899 by Mr. Herbert Carmichael, provincial assayer:

"The Rose Marie group consists of the Rose Marie, Nos. 1, 2, 3, 4, and 5, and is owned by the Rose Marie Mines, Limited; head office, Vancouver; Mr. Barclay Bonthrone, manager. The property is situated on the eastern slope of Elk River, some little distance above the point where that river flows into Kennedy Lake, which, in turn empties itself by Kennedy River into Tofino Inlet on the southeast side.

"Deep draught vessels can safely enter the mouth of Kennedy River, but can proceed no further, as a series of rapids, extending for some 500 yards and having a total fall of nine feet at high water, renders it difficult, even with the highest tide to pole a canoe up-stream against the current.

"Kennedy River, from these rapids up to the lake, a distance of some four miles, is comparatively deep and tranquil, and is navigable for boats carrying freight, as also is Kennedy Lake for its full length of 14 miles. The width of the latter is five miles.

"Elk River, which flows into the arm at the head of Kennedy Lake, is navigable, for canoes only, as far up as the Rose Marie group.

"The mountain, upon the side of which the property is situated, rises abruptly above the water for some 1,000 feet, and, about half-way up this slope, there outcrops a quartz vein, of from 15 to 36 in. in width, exhibiting a banded structure, and having well-defined walls standing out clearly and distinctly against the bluff. This vein has been traced up the side of the hill and, for a distance of more than 100 feet, across the more level summit.

"Such development as had taken place, at the time of my visit, was confined to surface stoping and open cuts, no underground work having been done.

"The quartz in the lode is mineralized with iron pyrites, occurring in streaks or bands parallel with the walls of the vein. This pyrite contains fair value in gold, about $12 to the ton of ore. It is the intention of the owners to concentrate the ore, experiments having shown that the 12 tons will yield about one ton of concentrate. This concentrate will then be shipped in flat boats down the river and lake to Tofino Inlet, and thence by steamer to a smeltery.

"A concentrator building had been erected on the river bank, and, at the time of my visit, the machinery was being placed in position. This consists of a 7x12 Dodge crusher, two Tremain steam stamps (small size) and one Wilfley table. It was also intended to put in a second Wilfley table and a classifier.

"The motive power will be supplied by a small engine, while a 50-h.p. boiler, now on the ground, and which will be followed later by a second, will provide steam for the stamps and pumps, and also for a two-drill Rand compressor."

PANAMA AND OTHERS.—High up the mountain on the opposite side of Bear Lake to the Lucky Jim are situated the Silver Glance, Empress, London Hill, Panama, and other mineral claims, some of which have been worked intermittently in the past. Of these, the London Hill and Panama each had a few men on them in August. From Mr. Miller, who is interested with Mr. H. Giegerich, of Kaslo, in the latter, and who was met at the Lucky Jim Company's office, it was ascertained that at the London Hill Major von Moerkerke has been getting out ore lately, with three men employed, but the quantity extracted is small. The Panama had been under bond to some Spokane and Vancouver men, but they relinquished possession last June and Mr. Miller had lately been taking out ore, of which some 600 to 700 sacks had been packed down to Bear Lake, and a similar quantity was at the mine waiting for the packers to take it down to the railway. As soon as enough shall have been accumulated near the railway, a carload will be shipped to the smelter at Trail. Across the divide from the before-mentioned claims, on the slope drained by the north fork of Carpenter Creek, is situated the Jo Jo, from which a small quantity of very high grade ore was taken some time ago; the chief value of that ore was in gold, as compared with high silver value from the Silver Glance and others in its vicinity.

RAMBLER-CARIBOO.—From the Lucky Jim the route mapped out for the trip was by an old trail up the mountain to the Rambler-Cariboo mine, situated well up in McGuigan Basin, at an altitude of about 6,000 feet. In the Annual Report of the Minister of Mines for 1911 may be found an account of this property, prepared by the provincial mineralogist, from which part of the following information has been taken.

This mine is now held by the Rambler-Cariboo Mines, Ltd., a company with an authorized capital of $1,750,000, and having its head office at Kaslo, B.C. Mr. A. F. McLaine, of Spokane, Washington, is president, and Mr. W. E. Zwicky, of Kaslo, general manager. The Rambler-Cariboo group has, under various ownerships, been one of the largest ore-shippers in the district. The following is a rough estimate of the total shipments, including crude ore and concentrates, made from the mine up to the end of 1910: Shipments since 1893 have been about 23,384 tons, containing 2,216,800 ounces of silver and 13,676,885 lbs. of lead. These figures show the average recovered contents of the ore shipped to

have been about 95 oz. of silver to the ton and 30 per cent. lead. In addition the ore contains from 10 to 14 per cent. zinc.

The rock formation of the district is slate, through which a great boss of granite has been forced up, the whole being much cut by porphyry dikes. A well-defined quartz vein cuts through both the slate and the granite, crossing the contact, and this has been traced on the surface for a long distance, in a northeast-by-north direction, with a dip to the south, or into the hill.

The mine was originally opened by three cross-cut tunnels, connecting with levels about 100 feet apart. No. 3 was the main working tunnel; it had a cross-cut 510 feet long to the vein, and drifts to the extent of more than 1,200 feet. Above this level all the ore, except a few small bunches, was extracted some years ago. From this No. 3 level a shaft was sunk 500 feet, with levels Nos. 4, 5, 6, 7 and 8 at intervals of 100 feet, and there much productive mining was done, and some very good ore obtained. The expense of hoisting from this shaft to a higher level, together with the cost of keeping it unwatered, added so much to the cost of mining that the company decided to abandon the workings temporarily, and to drive a long cross-cut adit into the vein at the 1,400-foot level, and to put up a raise to connect with the shaft, and thus reach the known ore body from below.

The portal of this lower tunnel is on Dardanelles Creek, about half-way between the site of the former McGuigan station, on the Kaslo and Slocan Railway, and the old mine workings, and near the wagon road. The tunnel is 9 feet 6 inches high by 7 feet wide (7 feet by 7 feet 6 inches in the clear), and its length is about 4,500 feet. It cuts the vein at rather more than 600 feet below No. 8 level. The contract price at which the first 2,500 feet of this tunnel was driven was between $10.50 and $11.50 per lineal foot, this price covering everything but compressed air for operating the drills, the latter having been supplied by the company. The remaining 2,000 feet was driven by daywork. The gross cost of the entire tunnel, including management and all other expenses, was $14.60 a lineal foot, and the rate of progress made was 7 feet 3 inches a day for 24 hours.

Where crossed on the 1,400-foot level, the vein was not recognized, and the tunnel was driven 90 feet past the place where the projection of the vein indicated it should be found; consequently, it was determined to reach the vein at the nearest point under the old shaft, so a diagonal drive was made and raising from this to the vein commenced in the country rock. When the raise was up 200 feet a cross-cut was driven to the vein, which was reached at 47 feet, and was found here to be about 8 feet in width, and to contain several streaks of clean galena. The raise was continued in the vein up to the 800-foot level. Subsequently, a second raise was put up from the 1,400 to the 1,200-foot level, so as to be in line with that from the 1,200 to the 800-foot level. Other shoots of ore than those previously known to occur have since been found on levels opened from this raise, so that practically a new mine has been developed.

Levels have been driven at 900, 1,050, 1,200 and 1,400 feet depth, and ore in considerable quantity and of good grade has been found on all but the deepest, on which last, however, while some 40 feet of ore has been passed through, not sufficient work has yet been done to reach the large orebody it is expected will be found on this, the deepest, level in the mine. Latterly, nearly all the development work done has been on this level. Stoping has been done on other levels, but not a great deal of ore has been mined during the past year or so—only about sufficient to meet the current expenditure in operating the mine—pending the completion of provision for milling the lower-grade ore and transporting to the railway the sorted crude ore and concentrate. Up to August 1st of this year between 700 and 800 tons of sorted ore has been shipped to the smeltery. There is large dump of milling ore at the mine, probably 6,000 to 7,000 tons, and it is estimated that there will be sufficient silver, lead, and zinc recovered from this to more than pay the cost of the aerial tramway in course of construction from mine to concentrating mill, and of erecting the mill and removing the plant from the old concentrator to the new. Ore bins at the upper and lower terminals, and the tramway will probably be completed by the beginning of September, while it will be six weeks or two months later before the mill will be ready for operation. Meanwhile a spur from the railway to the mill is being put in, and this will be ready for use by the time the mill construction shall be finished. Thereafter, it is expected, production will be continuous, and the company will begin to make profits on its operations, for it has much ore of good grade opened for extraction whenever it shall be advantageous to mine and ship it.

THE PRICE OF CHROME ORE.

Chrome ore varies in price from $10 to $20 per ton, depending on grade of ore conditions and supply. Imported ore from New Caledonia carrying 50 per cent. chromic oxide was quoted in New York in 1910 at an average price of $15 per long ton in carload lots, exclusive of cost of transportation. In 1909 the price averaged $16.24 per ton. If the chromic oxide exceeds 50 per cent., the value of the ore rises in proportion; if the chromic oxide is less than 50 per cent., the value of the ore decreases at a more rapid rate. The price of the California ore is governed almost entirely by local conditions, as there is little or no competition with foreign ores. The price of chrome bricks f.o.b. Pittsburg is $175 per thousand. American potassium bichromate was sold at 7¾ to 8 cents per pound and the Scotch product at 10¾ cents per pound in the latter part of 1910.

ESTIMATING IRON ORE RESERVES.

Estimating ore reserves requires the determination of the number of cubic feet per ton. In the case of iron ore this varies from 7 to 18, and in making estimates of Michigan ores, C. K. Leith used the following figures: Marquette hard ores, 8; Menominee and Gogebic ores, 10; soft ores of the Marquette, Crystal Falls, and Iron River districts, 12; low grade high silica ores, 14. The Oliver company uses the figures 10 cubic feet per ton throughout, on the assumption that the error in this figure is considerably less than in assumptions as to dimensions of orebodies.

VENTILATION IN PITCHING SEAMS.

A correspondent of the Coal Age, referring to the methods of ventilation in the pitching seams of the anthracite region states that the airway is often driven above the gangway and the air conducted to the cham

bers by a short crosscut or "monkey airway;" and, after passing through the chambers, the air is then conducted back to the gangway, which is thus made the return of that section of the mine.

He notes that this system of ventilation brings all the smoke from the chambers down on to the gangway and, consequently, interferes considerably with the work of the drivers in loading the cars and hauling them out of the mine. He suggests that a better plan would be to bring the air in on the gangway and carry it up the chambers and into the airway above, thereby making that the return air course. This would not only keep the chambers clear of smoke and enable the miner to get out more coal; but it would greatly assist the work of the drivers, in gathering their trips. Such an arrangement would greatly increase the output of the mine.

As similar conditions obtain in Alberta this suggestion will no doubt be of interest to those now engaged in developing pitching seams in that Province.

THE BEHAVIOUR OF NITROGLYCERIN WHEN HEATED.

A knowledge of the action of heat upon nitroglycerin is important a scontributory to the information on the stability of explosives and on the behaviour of large masses of explosives when burning, and the relation of such facts to fire in magazines and nitroglycerin factories. The subject has been recently investigated by the U. S. Bureau of Mines, whose conclusions are summarized as follows:

Nitroglycerin begins to decompose at temperatures as low as 50 or 60 degrees C. Even at very low temperatures it tends to be somewhat volatile, while at higher temperatures both the decomposition and the evaporation of nitroglycerin increases. The decomposition of nitroglycerin is accompanied by the evolution of much heat. At temperatures between 145 and 215 C. the ebullition becomes more and more violent; and at about 218 C. nitroglycerin explodes.

BOUNTIES IN 1911.

With the expiry last year of the bounties on iron and steel, Canada paid comparatively little during the past fiscal year for the special encouragement of industries under the bounty system. Thus the total amount paid on bounty account during the year ending on March 31st, last, was $538,529 only, as compared with $1,591,-663 paid during the proceeding year. The distributions were as follows: Wire rods, $160,750; crude petroleum, $141,935; lead, $179,288; Manilla fibre, used in the manufacture of binder twine, $50,536.

Since 1896, when the bounty system was introduced, the total payments have been rather over twenty-one millions, of which amount seven millions was paid as represented bounties on pig iron, over four millions on puddled iron bars, and six millions on steel manufactured in Canada.

SPECIAL CORRESPONDENCE

ONTARIO

COBALT, SOUTH LORRAIN

GILLIES LIMIT.—The excitement in the Gillies Limit has grown far beyond all expectations and has assumed almost dangerous proportions. The Ontario Government has thrown open to staking 3,303 acres, including several claims that were not sold at the previous auctions of 2,000 acres. This means that there are about 150 acres claims to be staked of 20 acres each. Though the Order-in-Council specifies that the new acreage shall only be opened to prospecting on August 20, as a matter of fact every foot of the ground has been run over by hundreds of men, and to-day hundreds are camping upon the ground. Upon one of the claims, indeed, some ten men are working at a discovery that has been made, though they have no manner of right to the property till after it has been properly staked next Tuesday. On one claim this week fifty men, most of them in parties of threes and fours came together until there were fifty on the one bluff.

The Limit will be thrown open at one minute after midnight on August 20th. As there are dozens after the same claims it resolves itself into a contest in staking and a Marathon to the recording office at Haileybury in order to be the first in line when it opens at half past eight. In the early days the name of the Gillies Limit conjured up to every prospector the thought of it, hidden veins of Crown Reserve richness and the old glamour has drained the whole of the north country of prospectors till the Limit to-day has brought together all the old veterans of Cobalt, Larder Lake, Gowganda, South Lorrain, Elk Lake and Porcupine. The high price of silver and the reopening of many old silver prospects at Cobalt has all helped to inflame the popular imagination.

So far the record of the Gillies Limit has not been encouraging to further exploration. The public, chiefly of Montreal, has paid hundreds of thousands of dollars to the Ontario Government for lots, and not a cent of profit has been made out of any claim sold within its borders.

Purchasers of lots at former sales appear to have a just grievance. They have paid for their claims anything from two thousand to $35,000, and yet they are burdened with a royalty on any future profits they make. Just as good ground is now being thrown open for the staking and no royalty is exacted.

SUCCESSFUL HYDRAULICKING.—Several finds of minor importance have been made as the result of the hydraulicking operations at the Nipissing. The latest discovery is a vein of silver ore, probably an extension of vein 128 and several smaller stringers have been uncovered. In view of the great richness of all silver veins in this conglomerate area all of these finds, however small, on the surface, will be developed during the winter.

BAILEY COBALT.—It is understood that the Bailey Cobalt will soon make a shipment of high grade ore. This claim for the past two years has been developed by a Chicago business till lately associated with the Pullman Company. A thoroughly modern plant is installed under competent technical management. The ore is not sufficiently high grade to allow of direct shipment, but there is a considerable tonnage that would pay to concentrate on the spot, or at a neigh-

boring property. The Penn Canadian Mining Company is also doing quite as well as they expected, so the vicinity of Diabase Mountain is once more active.

FOSTER REDIVIVUS.—Mr. T. J. Flynn and the syndicate with which he is associated, is making arrangements to open up the Foster again. The success of the Lawson at the lower levels makes the salvage of the old mine a possibility. There are also deals pending for the working of the Cochrane near the Temiskaming, but for the time being negotiations for the leasing of the King Edward have fallen through.

BEAVER EXPANDS.—The Beaver Consolidated Mining Company of Cobalt has purchased the Donaldson property at Elk Loke, to date by far the most promising of the silver prospects in that section of the country. A shaft has been put down for 150 feet and mining done with the result that according to the report of a conservative engineer who has just been over the property, "it is an excellent prospect." It is also reported that the Buffalo mines have purchased some claims with a view to development. The completion of the Elk Lake branch of the T. & N. O. railway this fall will bring these porperties within easy reach of the smelters.

DIVIDENDS.—Cobalt dividends continue to pile up. Next month the Crown Reserve will pay its thirty-first dividend, and will have returned to shareholders no less than 250 per cent. On par or altogether $2,402,021. The fact that the McEaneny, the Porcupine venture of the Montreal company is developing most satisfactorily, will give satisfaction to shareholders who believe that all good things must have an end some time.

In 1908 when the McKinley-Darragh was paying its second dividend, a mining engineer who had been sent to examine the property, reported to his principals that it was possible that another car of ore might be scraped together, but then the end would be nigh. On Oct. 1st the company will have paid 126 per cent. on capitalization, or $2,830,558.

SHIPMENTS.—The shipments from the Cobalt camp in ore and bullion for the week ending Aug. 17, were: Crown Reserve, 44,966; City of Cobalt, 85,500; Cobalt Townsite, 105,000; Cobalt Lake, 63,100; La Rose, 85,800; McKinley-Darragh, 76,200; Trethewey, 82,000; Temiskaming, 63,704; Kerr Lake, 60,981. Total 667,251. Bullion, Crown Reserve, 39,660 ounces, $26,000; Dominion Reduction Company, 24,630, $14,778; Trethewey, 3,990 ounces, $2,394; City of Cobalt, 2,667, $1,267; Buffalo, 11,500, $7,000. Total, 82,449 ounces, $51,439.

The growth of cyanidation and amalgamation in the camp can be seen by the fact that although the Nipissing shipped no bullion at all the output was over $50,000. In the ore shipments the 38 tons of the McKinley-Darragh contained $142,000.

PORCUPINE AND SWASKIKA

KIRKLAND LAKE.—Another discovery in the Kirkland Lake section of the Cobalt camp is causing some interest among prospectors. This is the find made by W. Costello in Barnhardt Township, three miles north of Kirkland Lake. With the Tough, Terry, and Costello claims offering opportunities it seems probable that there will be considerable activity in this portion of the mineral belt.

REA.—Since it started operations the Rea mine at Porcupine has cost the company $790,410 on capital account, and $114,399 on development account, a total of $905,470. There is cash on hand amounting to only $660 to meet bills and other liabilities amounting to $3,838. Though several attempts have been made no way has yet been discovered of financing the company so that development work can be resumed. There is a considerable amount of good ore above the 200 foot level, but below that the values in the vein would not pay for taking the ore out and treating it.

SWASTIKA.—Progress is being made with the construction of the mill at the Swastika mine. The concrete foundation has been completed, and the framework is now in place. The machinery is all ordered and should be on the ground in a month's time. The mill building will measure 30 feet by 86 feet, and for the present saving will be made by amalgamation alone although provision is being made in the mill for cyanide tanks. The tailings from the mill will be dammed up so that they will be available for re-treatment.

Among the few mining companies now being incorporated the Anchorite Mining Company, with the modest capitalization of $250,000, will operate in Northern Ontario. The company has headquarters at Toronto.

STANDARD LIQUIDATES.—As the creditors of the Standard Gold Mining Company have refused to accept 40 cents on the dollar the company has gone into liquidation, and the assets will be sold by auction. The company is $10,000 in debt. The company has 200,000 shares in the treasury, but cannot realize on them. The surface showings on the Standard were very spectacular. The property was diamond drilled, and on the strength of a very rich core that was handed round much stock was sold. The origin of the gold in that core is one of the mysteries of the camp for the body from which it was cut has never been located.

PORCUPINE LAKE EQUIPMENT.—The Porcupine Lake Mining Company has ordered a complete plant for the further development of its claims near Golden City and under Porcupine Lake. The plant includes a ten-drill compressor, boilers, and full equipment for a thorough development of the Hunter properties.

BRITISH COLUMBIA

GENERAL NEWS.—The 10-stamp mill put in some time since at the Inland Empire Mine, which is situated three and a half miles from Paulson, a stopping place on the C. P. R. line between the Columbia River and the Boundary district, has been in operation lately. It is reported to be making a good percentage of extraction, but no particulars have been received from those in charge of operations.

The aerial tramway that was for years at the Le Roi mine, Rossland, is to be used to convey ore from the No. 1 mine to the shipping wharf at the Highland concentrator, near the town of Ainsworth, Kootenay Lake. The No. 1 and Highland properties are both held by the Consolidated Mining and Smelting Company of Canada, Limited, under option of purchase and the former, which in the early days of Ainsworth belonged to residents in the Maritime Provinces, has been for a long time an intermittent producer of ore.

The Hobson Silver-Lead Company, Ltd., of Spokane, Wash., is working the Yankee Girl group mine, near Ymir, Nelson mining division. It is stated that the company, which two or three years ago operated this property, took out ore of a total value of about $160,000 from an orebody mined from No. 1 adit up to the surface, a distance of 400 feet. The same company commenced driving two other adits at lower levels, but got into financial difficulties before the payable orebody was reached. The Hobson Company is continuing driving adits Nos. 2 and 3, and it is expected No. 2 will soon enter the oreshoot being driven for.

The Blue Bell mine and concentrator, on the east side of Kootenay Lake, opposite Ainsworth, are again being operated, after having been inactive for between two and three years. Hoisting and pumping machinery has been put in the mine, and the treatment capacity of the mill enlarged. There is much lead ore in this mine, which is owned by the New Canadian Metal Company, of which Mr. S. S. Fowler is general manager. It is intended to continue ore production without interruption.

The Eureka mine, in Nelson mining division, has been taken under a working bond, with option of purchase, by the British Columbia Copper Co. This property, situated about 9 miles from the town of Nelson, and two and a half miles from Granite Siding on the C. P. R., line west of Nelson, is reported to have about 10,000 tons of ore in sight. Assay returns have shown from 4 to 8 per cent. copper. Some of the machinery and plant that had been used at the B. C. Copper Co.'s Wellington group mine, Boundary district, is being taken to the Eureka, at which latter development will be undertaken without delay.

Much work is being done on the Granby Consolidated M. S. and P. Co.'s Hidden Creek mine, at Granby Bay, Observation Inlet, both underground and on the surface. The improvements above ground include construction of a shipping wharf, erection of buildings, grading of the site for a 2,000 ton smeltery, construction of railway from the wharf up the mountain to meet the tramway, and thence by a switchback to the smelting site, and construction of dam and other works in connection with the establishment of a hydro-electric power generating station, to supply power for mine, smeltery, and railway. Developments in the mine continue to be satisfactory, and that to a greater extent than was looked for when purchase of this property was decided upon. What is known as the 385-foot tunnel (that is 385 feet above the sea level at Granby Bay), has cut No. 1 ore body 145 feet below the upper tunnel, known as the 530-foot tunnel, and there has now been proved a vertical depth of about 700 feet in ore. Average assay returns from the ore passed through on the 385 foot level give rather better than two per cent. copper, as compared with the earlier estimated copper content of 1.65 per cent. Much work has been done in preparation for opening stopes as soon as it shall be advantageous to take out ore.

At the Corbin Coal and Coke Co.'s colliery in South-east Kootenay, a railway, to be about seven miles long, is being constructed from the British Columbia Eastern Railway (which connects the Corbin mine with the C.P.R. Co.'s Crow's Nest Railway at McGillivray Station, near the Loop), up to what is known as the "lower big showing" of coal, occurring on the mountain above the Corbin mine. There is here an enormous body of coal which it is intended to work as if it were a big quarry, and the coal will be loaded from the pit that will be opened, directly on to railway cars.

Included in the information obtained during a recent trip to several of the interior mining districts of the province is that concerning a number of mines in the Slocan, which district is attracting increasing attention among mining men prepared to do much development work where there is a reasonable prospect of ore in quantity and of a profit-yielding grade, being obtained.

Some Slocan District Mines.

In the following notes no particulars will be given of mines in Ainsworth mining division, which is usually regarded as part of the Slocan district as distinguished from the Slocan and Slocan City mining divisions, for none in Ainsworth division were visited on this occasion.

Leaving New Denver, on Slocan Lake, early one morning in August, the train was taken to Three Forks, on the C. P. R. line from Nakusp to Sandon, the former being situated on upper Arrow Lake, which is an enlargement of the Columbia River, and the latter a mining town in the heart of the Slocan country. From Three Forks, so named because of the junction here of the three forks of Carpenter Creek, the way lay up the middle fork, known as Seaton Creek, to Bear Lake on the summit of the divide between Slocan and Ainsworth mining divisions. A branch of the Nakusp-Sandon railway has quite lately been constructed from a short distance on the Sandon side of Three Forks to Bear Lake, this being intended to provide transportation facilities for the Lucky Jim, Rambler-Cariboo, and other mines in the eastern part of Slocan mining division. From Three Forks to the Lucky Jim mine, which is near Bear Lake, the distance is between four and five miles.

When the disastrous forest fire of the summer of 1910 swept through this part of the Slocan it deprived the Lucky Jim, Rambler-Cariboo, and other mines of transportation, for it destroyed trestles and bridges along the old Kaslo & Slocan railway, over which ore had been taken to Kaslo during many previous years. Further, it consumed the surface works and mine buildings of the principal mines, so that they were left at a great disadvantage, and this, too, just at a time when they were about ready to ship ore in considerable quantity. The Lucky Jim lost its compressor plant, tramways from mine adits to railway, mine buildings, and all other surface improvements. Further, there was no wagon road communication to points on a railway, so that the condition was serious, and a similar state of affairs largely existed as regards the Rambler-Cariboo mine as well. However, mine owners and government immediately co-operated to put the old disused wagon road to Three Forks into some kind of shape for hauling, and a determined effort was made in part to restore conditions that would admit of development work being continued, even should the shipment of ore not be found practicable for the time. In the course of the following fall months new buildings were erected, plant got in, and work in the mines resumed. Finally, when it was found that the Kaslo & Slocan railway was not likely to be rebuilt, the C. P. R. company was induced to build a spur line from Three Forks to Bear Lake. This construction was com-

menced last year, but it was only a few weeks ago that the steel was laid and transportation facilities were again available.

LUCKY JIM MINE.—The Lucky Jim mine has long been known as the only mine in British Columbia that, up to the time of suspension of ore shipments in 1910, had shipped crude zinc ore in any considerable quantity. It has been opened at different levels, and it is stated that there is much ore available for shipment above the No. 5 level. During the last year or so No. 6 level has been driven to the lime formation in which occur large lenzes of zinc ore in No. 5 and higher levels, but at the time of writing development work has not been sufficiently advanced to determine whether or not the ore continues down to No. 6, which is several hundred feet lower than No. 5, though it is believed that large shoots of shipping ore will also be found on this level.

Early in August a single car of ore was shipped from the mine, but this was ore that had been left alongside the railway track when the fire did so much damage in 1910, as above outlined. When visited recently it was ascertained that No. 6 adit had entered the lime dike at about 1045 feet from its portal, and that the drive was continued for 110 feet across the lime, the limit of which was not reached when it was decided to explore the footwall side of the dike for ore. Driving was then undertaken near the footwall, and at 83 feet some ore was found, but not the large body sought for. This drive is now in about 500 feet, and it is believed No. 2 orebody, which is large in No. 5 adit, will soon be reached. This level is at a vertical depth of about 450 feet below No. 5, and nearly 800 feet on the incline, the lime having flattened out considerably in comparison with its position in the higher levels. It is the opinion of the superintendent that a big body of ore occurs somewhere near where the adit enters the lime, and this will be prospected for later; it may be found on the hanging wall side. For the present, the intention of the management is to pay most attention to the shipment of ore from No. 5, now that the railway has been constructed to the mine, and it is planned to ship one car of ore a day from that level until such time as the output can be increased.

An aerial tramway from No. 5 down to the loading bins alongside the railway was practically completed when the mine was visited, and it was intended to give the tram a trial run the next day. The tramway is equipped with two buckets working in balance. Two ore bins have been built at the head of the tramway, each of 50 tons capacity, and a 125-ton bin at the lower terminal.

The resumption of shipment of ore in considerable quantity will give much satisfaction, not only to those directly interested in the Lucky Jim Zinc Mines, Limited, but as well to all connected with mining in the vicinity, for it will stimulate other mine owners to do development work and to prepare for making an output of ore when they shall have their work advanced to a stage that will admit of this being done.

STATISTICS AND RETURNS

NOVA SCOTIA COAL SHIPMENTS

Intercolonial Coal Company.

Shipments July, 1912	15,508
Shipments July, 1911	21,886
Decrease July, 1912	6,378
Shipments 7 months, 1912	123,480
Shipments, 7 months, 1911	146,086
Decrease 7 months, 1912	22,606

Dominion Coal Company, Ltd.

Output or July, 1912	409,125
Shipments July, 1912	476,208
Shipments July 1911	375,147
Increase July, 1912	101,061
Shipments 7 months, 1912	2,295,297
Shipments 7 months, 1911	1,945,591
Increase 7 months, 1912	349,706

Springhill.

Shipments July, 1912	24,394
Shipments July, 1911	20,815
Increase July, 1912	3,579
Shipments 7 months, 1912	201,116
Shipments 7 months, 1911	66,708
Increase 7 months, 1912	134,408

Inverness Railway and Coal Company.

Shipments July, 1912	20,264
Shipments July, 1911	21,130
Decrease July, 1912	866
Shipments 7 months, 1912	152,595
Shipments 7 months, 1911	152,122
Increase 7 months, 1912	473

Acadia Coal Company.

Shipments July, 1912	25,083
Shipments July, 1911	30,425
Decrease July, 1912	5,342

Shipments 7 months, 1912	201,231
Shipments 7 months, 1911	218,624
Decrease 7 months, 1912	17,393

Nova Scotia Steel and Coal Company.

Shipments July, 1912	86,080
Shipments July, 1911	71,750
Increase July, 1912	14,330
Shipments 7 months, 1912	413,290
Shipments 7 months, 1911	340,451
Increase 7 months, 1912	72,839

COBALT ORE SHIPMENTS.

The ore shipments for the week ending August 17 were small, there being shown a great decrease compared with the shipments of last week which were above the average. Nine mines only sent out ore, all of this being high-grade, the one car sent by the McKinley alone being worth $142,231. The shipments for the week in pounds were as follows:

Crown Reserve	44,966
City of Cobalt	85,500
Townsite	105,000
Cobalt Lake	63,100
La Rose	85,800
McKinley	76,200
Trethewey	82,000
Temiskaming	63,704
Kerr Lake	60,981
Total	667,251

The shipments for the year to date were as follows:

	Week.	Year to Date.
Beaver	....	$219.75
Buffalo	....	708.44
Casey Cobalt	....	212.15
City of Cobalt	$42.75	855.26
Cobalt Lake	31.55	497.76
Cobalt Townsite	52.50	1,007.31
Chambers-Ferland	....	257.05
Coniagas	....	1,351.46
Crown Reserve	22.48	324.56
Drummond	....	330.30
Hudson Bay	....	440.06
Kerr Lake	30.49	474.63
La Rose	42.90	2,229.26
Lost and Found	....	15.00
McKinley-Darragh	38.10	1,740.09
Nipissing	....	1,444.38
O'Brien	....	345.62
Provincial	....	22.22
Right of Way	....	180.01
Temiskaming	31.85	744.93
Trethewey	41.00	353.89
Wettlaufer	....	229.04
Totals	$333.62	$14,033.30

Although the Nipissing did not contribute at all to the bullion shipment of the week the amount sent out was well up to the average weekly shipments of silver from the camp. Four mines contributed to the total shipments while the Dominion Reduction Company sent out a large consignment, part of which was bullion from Kerr Lake ore. The shipments for the week were as follows:

	Ounces.	Value.
Crown Reserve	39,660.26	$26,000.00
Dom. Red. Co.	24,630.00	14,778.60
Trethewey	3,990.32	2,394.16
City of Cobalt	2,667.54	1,267.20
Buffalo	11,500.00	7,000.00
Total	82,449.06	$51,439.96

BRITISH COLUMBIA ORE SHIPMENTS.

(Week Ending August 10.)

Boundary.

	Week.	Year.
Surprise	235	3,025
United Copper	34	558
Granby	23,292	752,501
Mother Lode	7,920	228,316
Rawhide	7,490	133,707
Napoleon	508	4,522
Unnamed	210	7,130
Nickle Plate, milled	1,500	46,500
Other mines	....	19,561
Total	41,189	1,195,820

Nelson.

Queen, milled	300	7,500
Mother Lode, milled	350	3,450
Molly Gibson, milled	300	3,300
Granite-Poorman, milled	250	8,250
Hudson Bay	39	69
Queen	31	383
Granite-Poorman	30	219
Other mines	....	10,108
Total	1,300	33,279

East Kootenay.

Sullivan	469	19,436
St. Eugene	67	554
Monarch	88	687
Society Girl	21	42
Monarch, milled	425	5,275
Other mines	....	5,452
Total	1,069	31,446

Slocan and Ainsworth.

Standard	184	5,347
Van Roi	92	1,665
Bluebell	94	193
Ruth	36	405
Whitewater	34	213
Jo Jo	8	8
Standard, milled	400	10,400
Bluebell, milled	175	800
Van Roi, milled	1,100	37,200
Other mines		8,314
Total	2,323	64,575

Rossland.

Le Roi	1,038	29,174
Le Roi No. 2 milled	300	4,400

Le Roi No. 2	60	16,217
Blue Bird	20	77
Centre Star	3,173	96,575
Inland Empire, milled	90	540
Other mines	....	57
Total	4,681	147,040

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	23,292	752,501

B. C. Copper Co.'s Receipts.
Grand Forks, B.C.

Mother Lode	7,920	228,316
Rawhide	7,490	133,707
Napoleon	508	4,522
Unnamed	210	7,130
Other mines	....	17,003
Total	16,228	389,678

Consolidated Co.'s Receipts.
Trail, B.C.

Centre Star	3,173	96,575
Le Roi	1,038	29,174
Sullivan	469	19,436
Surprise	235	3,025
Standard	184	5,347
Van Roi	92	1,665
Bluebell	94	193
Monarch	88	687
St. Eugene	67	554
Le Roi No. 2	60	16,217
Hudson Bay	39	69
Ruth	36	405
Whitewater	34	213
United Copper	34	558
Queen	31	383
Granite-Poorman	30	219
Society Girl	21	42
Blue Bird	20	77
Jo Jo	8	8
Other mines	....	8,536
Total	5,753	183,383

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

New York Curb.

	Bid.	Ask.
Braden	700	712½
B. C. Copper	500	525
Giroux	562½	587½
Greene Cananea	1012½	1025
Inspiration	1900	1937½
Yukon Gold	350	375
Goldfield Con.	362½	375
Nevada Hills	200	206¼
Miami	2962½	2975
Tonopah Mining	700	712½
Ray Con.	2187½	2200
Chino	3925	3937½
United Copper	625	1875

Cobalt Stocks.

	Bid.	Ask.
Bailey	5¼	5⅜
Beaver Con.	43½	44
Buffalo	145	150
Chambers Ferland	20¾	21
City of Cobalt	24	26
Cobalt Lake	29½	30
Coniagas	740	760
Crown Reserve	310	340
Great Northern	7½	8
Gould Con.	1	1½
Gifford	2	3¼
Green Meehan	1¼	1½
Hargraves	4¾	5
Kerr Lake	290	292
La Rose	297	305
McKinley Darragh	195	197
Nipissing	840	850
Ophir	8	11
Otisse	1¼	1⅜
Peterson Lake	8	8¼
Rochester	3	3¼
Right of Way	5	6¼
Silver Leaf	3	4
Silver Queen	3½	4½
Timiskaming	38	38½
Trethewey	40	45
Wettlaufer	43	46

Porcupine Stocks.

	Bid.	Ask.
Apex	2¼	2¾
Dobie	10	25
Crown Charter	7½	8
Dome Extension	10¼	10½
Eldorado	1	3
Foley-O'Brien	15	17
Hollinger	1220	1230
Jupiter	25	26
N. Ont. Exp.	200	250
Pearl Lake	17	18
Porcupine Imperial	2⅛	2⅜
Porcupine Tisdale	..	1
Preston East Dome	3⅛	3⅜
Rea Mines	25	35
Standard	½	1
Swastika	8	8¼
Vipond	26¼	26¾
United	..	1¼
West Dome	..	8

Sundry.

	Bid.	Ask.
American Marconi	750	775
Canadian Marconi	512½	550
Island Smelters	2¼	2¾

SILVER PRICES.

	New York Cents	London Pence
August 8	61	[illegible]
August 9	61	[illegible]
August 10	61¼	[illegible]
August 12	[illegible]	[illegible]
August 13	[illegible]	[illegible]
August 14	61¾	[illegible]
August 15	[illegible]	[illegible]
August 16	[illegible]	29
August 17	[illegible]	[illegible]
August 20	62⅛	[illegible]
August 21	[illegible]	[illegible]
August 22	[illegible]	[illegible]
August 23	62¼	[illegible]

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Phone Adel. 1890 Cables, "Grayland, Toronto"
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We are not brokers or dealers, but receive consignments; weigh, sample and assay them, and attend to settlement, collection and remittance on behalf of sellers.

WANTED
DIAMOND Drilling by Contract from companies who have their own drills and work to do. Can do work very reasonable as I would do work myself.
Experience in coal and all kinds of mineral drilling. Can furnish reliable reference. Address
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A DEPOSIT of pyrites within easy distance of the upper lakes, not more than five miles from railway or one hundred miles from shipping port, analyzing at least 42% sulphur. Owners of such property opened to produce about 20,000 tons a year or of promising prospects are invited to communicate with
"W" c/o Canadian Mining Journal.

BUYERS AND SELLERS OF METALS

ALPHABETICAL INDEX TO ADVERTISERS

The Canadian Miner's Buying Directory.

Amalgamators—
Allis-Chalmers-Bullock, Ltd.
Chalmers & Williams.
Fraser & Chalmers, Ltd.
Assayers and Chemists—
Milton L. Hersey Co., Ltd.,
Campbell & Deyell, Cobalt Ont.
Ledoux & Co., 99 John St., New York.
Thos. Hays & Son, 124 Yonge St., Toronto.
W. K. McNeill, 24 Adelaide St. West, Toronto, Ont.
Assayers' and Chemists' Supplies—
C. L. Berger & Sons, 37 William St., Boston, Mass.
T. Eaton Co., Toronto, Ont.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
John Davis & Sons.
Peacock Bros.
Consolidated Optical So.
Ball Mills—
Allis-Chalmers-Bullock, Ltd.,
Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.
Beams—Steel—
Dominion Bridge Co.
Allis-Chalmers-Bullock.
Mussens, Limited.
Belting—
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
Canadian Fairbanks - Morse Co., Ltd.
Federal Engineering & Supplies, Ltd.
Blasting Batteries and Supplies—
Thomas & William Smith.
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
Peacock Brothers.
John Davis & Sons.
Mussens, Limited.
Canadian Explosives, Ltd.
Blowers—
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Mussens, Limited.
Boilers—
Canadian Rand Company Ltd.
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.
Bone Ash—
Lymans, Limited.
Briquetting Machinery—
American Grandal Co.
Mussens, Limited.
Buckets—
Peacock Bros.
Link Belt Co.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.
Building—Steel Frame—
Dominion Bridge Co.
Canada Foundry Co.
Cable—Aerial and Underground—
Fraser & Chalmers, Ltd.
Cableways—
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.
Cages—
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.
Cables—Wire—
Standard Underground Cable Co. of Canada, Ltd.
Cars—
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.
Castings—
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.
Cement Machinery—
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.
Cement Testing—
Campbell & Deyell.
Can. Laboratories.
Chain—
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.
Chemists—
C. L. Constant & Co.
Canadian Laboratories.
A. H. Brown.
Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.
Classifiers—
Allis-Chalmers-Bullock.
Coal—
Dominion Coal Co.
Nova Scotia Steel & Coal Co.
Coal Crushers—
Peacock Brothers.
Jeffrey Mfg. Co.
Coal Cutters—
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.
Coal Handling Machinery—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Coal Mining Explosives—
Curtis & Harvey.
Coal Mining Machinery—
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
Peacock Brothers.
Jeffrey Mfg. Co.
Coal Punchers—
Sullivan Machinery Co.
Canadian Rand Co.
Coal Tipples—
Jeffrey Mfg. Co.
Coal Washeries—
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.
Compressors—Air—
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Laidlaw-Dunn-Gordon.
Canada Foundry Co., Ltd.
Walker Brothers.
Concentrators and Jigs—
American Grandal Co.
Duster Concentrator Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
Chalmers & Williams.
Concrete Mixers—
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.
Condensers—
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.
Converters—
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.
Conveyors—Belt—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.
Cranes—
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.
Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.
Crushers—
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Waterous Engine Co.
Chalmers & Williams.
Cyanide Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.
Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.
Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers, Drafting Materials.
John Davis & Sons.
A. L. Berger.
Peacock Bros.
Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.
Dredging Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
Driers—
Jeffrey Mfg. Co.
Mussens, Limited.
Drills, Air and Hammer—
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.
Drills—Core—
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.
Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.
Drill Steel Sharpeners—
Canadian Ingersoll-Rand Co.
Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.
Canadian Ingersoll-Rand Co.
Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.
Dynamite—
Curtis & Harvey (Canada), Limited
Canadian Explosives.
Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Jones & Moore Electric Co., Ltd.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.
Ejectors—
Mussens, Limited
Peacock Bros.
Elevators—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian Iron Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.
Elevator Buckets—
Mussens, Limited.
Engineering Instruments—
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.
Engineers and Contractors—
Fraser & Chalmers, Ltd.
Engines—Automatic—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.
Engines—Gas and Gasoline—
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.
Engines—Haulage—
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Engines—Oil—
Jenckes Machine Co.
Peacock Bros.
Engines—Steam—
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Engines—Traction—
E. Leonard & Sons.
Jenckes Machine Co.
Excavators.
Jeffrey Mrg. Co.
Mussens Limited.
Fans—Ventilating—
Fraser & Chalmers, Ltd.
Sullivan Machinery Co.
Jeffrey Mfg. Co.
Peacock Brothers.
Allis-Chalmers-Bullock.
Mussens Limited.
Feeders—Ore—
Fraser & Chalmers, Ltd.
Smart-Turner Machine Co.
Mussens Limited
Allis-Chalmers-Bullock, Ltd.
Filters—
John McDougall Caledonian Iron Works.
Fire Extinguishers—
Mussens, Limited.
Forges—
Mussens, Limited
Can. Fairbanks-Morse Co., Ltd
Forgings—
M. Beatty & Sons.
John McDougall Caledonian Iron Works
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers
Canadian Steel Foundries.
Furnaces—Assay—
Lymans, Limited
Mussens, Limited.
Fuse—
Peacock Brothers
Curtis & Harvey (Canada), Limited
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.
Gears—
Canadian Westinghouse
John McDougall Caledonian Iron Works
Smart-Turner Machine Co.
Peacock Brothers
Jeffrey Mfg. Co.
Generators—
Allis-Chalmers-Bullock
Canadian Westinghouse.
Peacock Brothers.

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Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

Galvanized Strand—
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

Girders—Steel—
Dominion Bridge Co.

Hangers—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Heaters—Feed Water—
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

High Speed Steel Twist Drills—
Mussens, Limited.

Hoists—Air, Electric and Steam—
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

Hoisting Engines—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

Hoists—Gas and Gasoline—
Mussens, Limited.
Waterous Engine Works.

Hoisting Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

Hose—
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

Injectors—
Mussens, Limited.
Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Lamps—Acetylene—
Mussens, Limited.
Fraser & Chalmers, Ltd.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Incandescent—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

Levels and Rules—
C. L. Berger & Co.
John Davis & Sons.
T. Eaton Co.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Mica Dealers—
Canada Metal Co.
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

Monel Metal—
Orford Copper Co.

Motors—
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

Ores and Metals—Buyers and Sellers of—
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Packing—
Mussens, Limited.

Perforated Metals—
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

Pipe Fittings—
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

Pneumatic Tools.
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

Producer—Gas—
Mussens, Limited.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

Pulleys, Shaftings and Hangings—
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pumps—Pneumatic—
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

Pumps—Turbine—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pumps—Vacuum—
E. Leonard & Sons.
Smart-Turner Machine Co.

Quarrying Machinery—
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

Roasting Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

Rolling Mill Machinery—
Peacock Brothers.

Rolls—Crushing—
Mussens, Limited.
Fraser & Chalmers, Ltd.

Roofing—
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Metallic Roofing.
Can. H. W. Johns-Manville Co.

Rope—Manilla and Jute—
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Rope—Wire—
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

Samplers—
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

Scales—
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

Screens—
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

Separators—
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

Separators—Magnetic—
American Grondal Co.
Wetherill Magnetic Separating Co.

Shovels—Steam—
Mussens, Limited.
M. Beatty & Sons.

Slime Tables—
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

Smelting Machinery—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

Smelters & Refiners—
Consolidated Mining & Smelting Co.

Stamp Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.
Fraser & Chalmers, Ltd.

Steel Drill—
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Bros.
Edgar Allen & Co.

Steel—Manganese—Castings—
Peacock Bros.
Hadfield's Steel Foundry Co.
Can. Steel Foundries.

Steel—Tool—
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
Edgar Allen & Co.
N. S. Steel & Coal Co.

Steel—Structural—
Dominion Bridge Co.

Surveying Instruments—
Peacock Brothers.
W. F. Stanley.
C. L. Berger.
Jno. Davis & Son.

Switchboards—
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Brothers. Dynamo Works, Ltd.

Tanks—Cyanide, Etc.—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.

Terminals—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Tramways—
Mussens, Limited.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Transformers—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Brothers. Dynamo Works, Ltd.

Transits—
C. L. Berger & Sons.
T. Eaton Co.
W. F. Stanley.
John Davis & Son.
Peacock Bros.

Tube Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

Turbines—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Brothers. Dynamo Works, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Water Wheels—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

Wheels—
Mussens, Limited.
Jeffrey Mfg. Co.

Winding Engines—
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd
E. Leonard & Sons.
Siemens Brothers. Dynamo Works, Ltd.

Wire Cloth—
Mussens, Limited.
B. Greening Wire Co.

Wire (Bare and Insulated.
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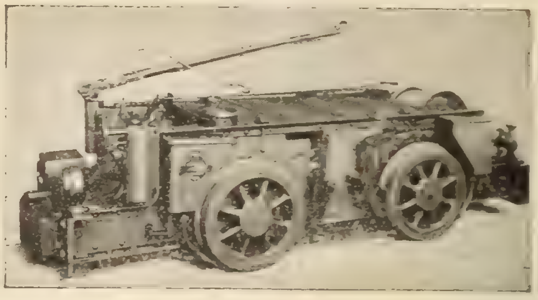

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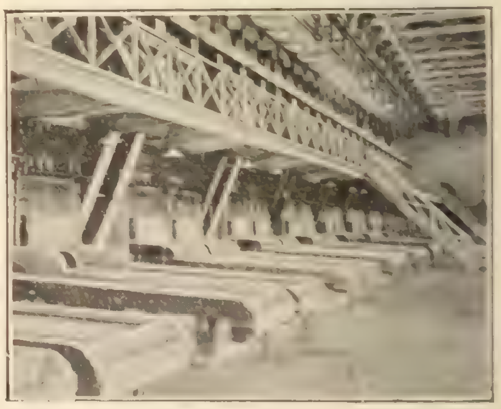

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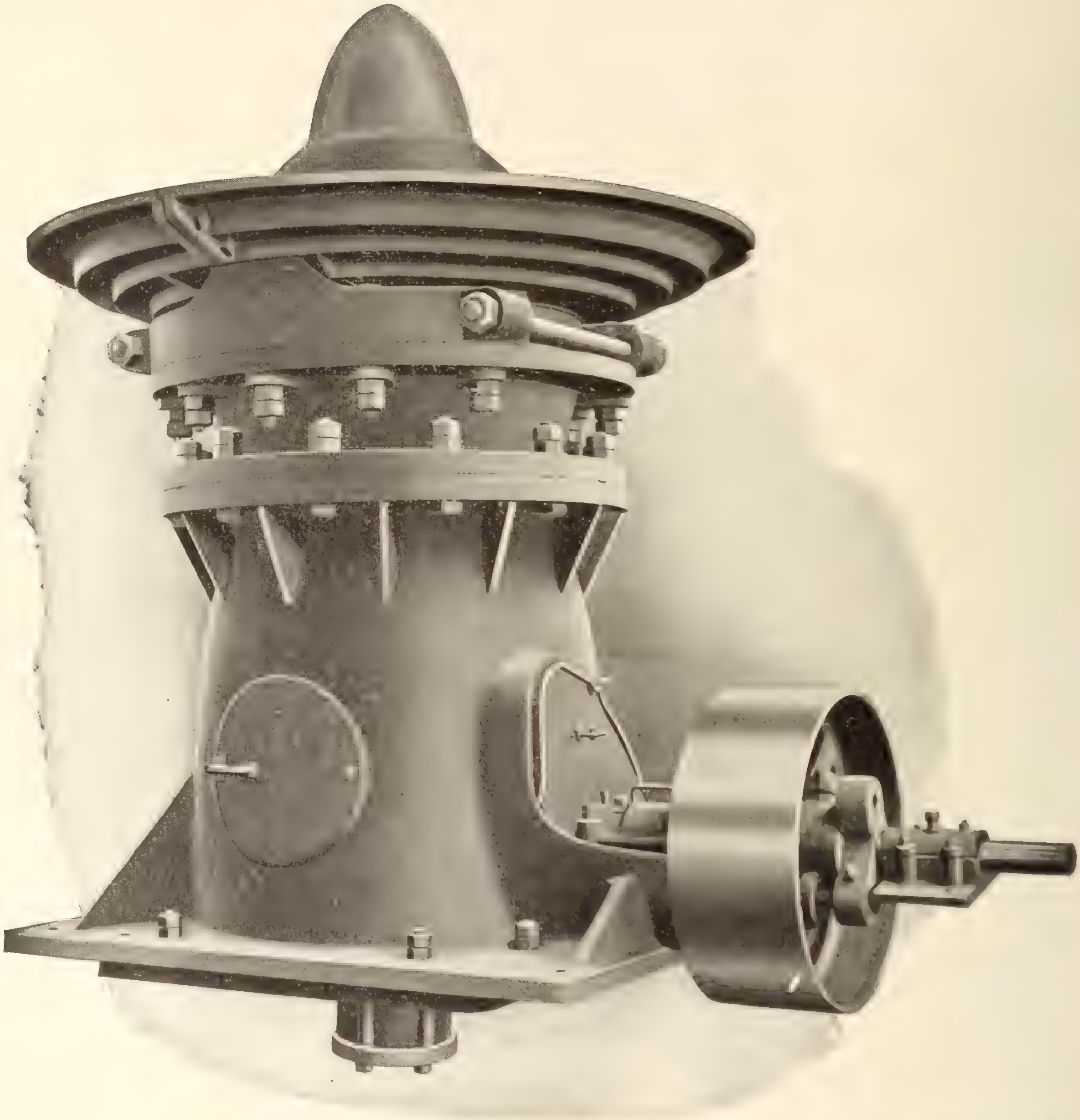

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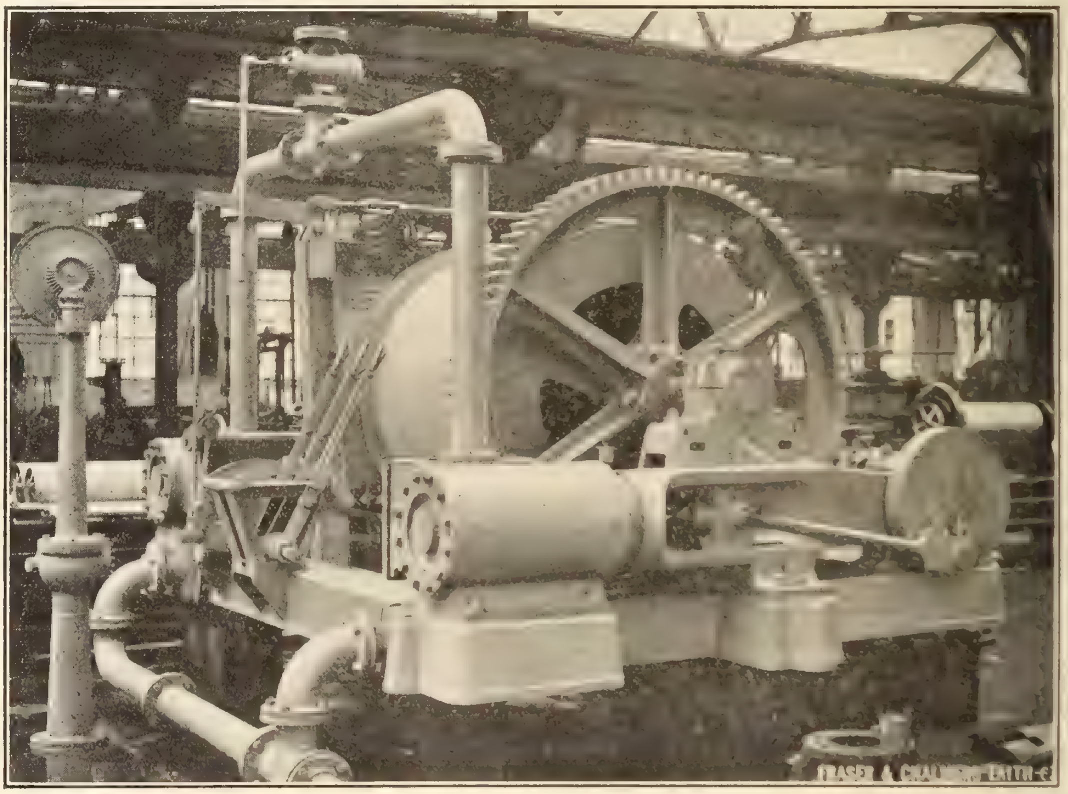

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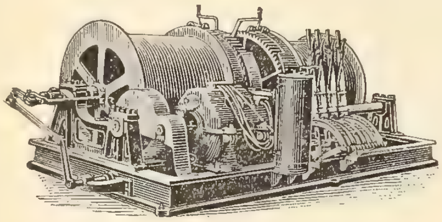

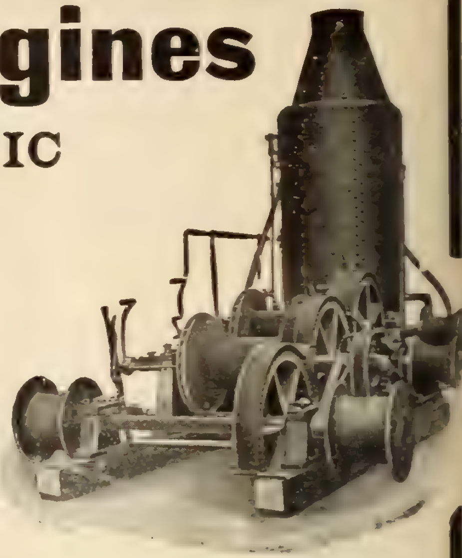

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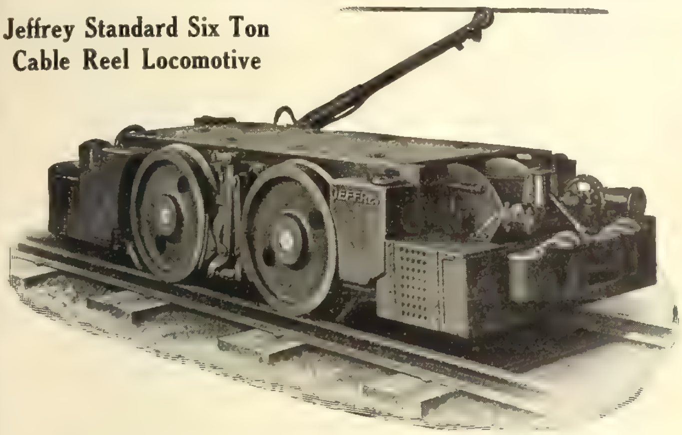

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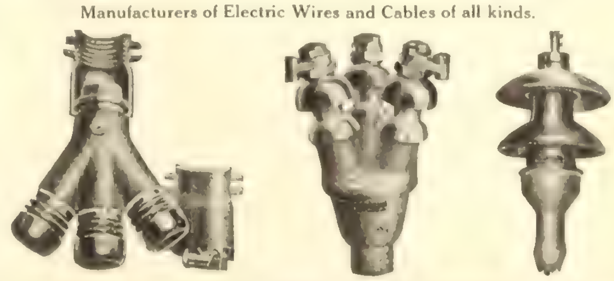

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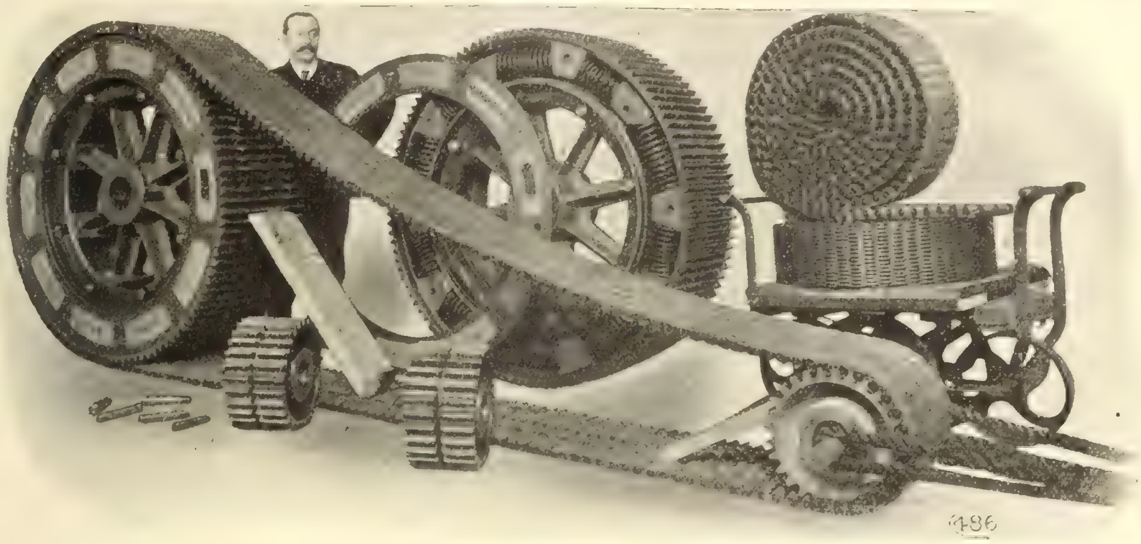

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Tin
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The Canadian Mining Journal

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CIRCULATION.

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CONTENTS.

THE MINERALS AND MINES OF NOVA SCOTIA.

So diversified and so numerous are mineral deposits and mining operations in the Province of Nova Scotia that it is out of the question within reasonable limits to present a complete description of even a few of the leading enterprises,.

Realizing this fully, it was early determined that the only practicable method of attack was to publish a selected and timely series of articles dealing mainly with late developments. It is proposed, further, to rearrange, modify, and add to this material at a later date with a view to embodying it in pamphlet form. But before expatiating further on these plans it is appropriate to have a look over the mining field of Nova Scotia generally.

GOLD.

Since the year 1862 Nova Scotian gold mines and prospects have yielded about $20,000,000 in gold. The recorded production for the year 1862 is just about equal to that for 1911. This fact, if one studies closely the history of the industry, is susceptible of favourable explanation. But that explanation, to be complete, must embrace the several physical, commercial, and human factors that have combined to militate against the industry. Here we need not debate the question at length. It suffices to state our deliberate conviction that there is ample reward awaiting the unprejudiced and competent investor in the gold regions of Nova Scotia. There are yet large areas of unprospected territory; and to correct the abuse due to long tenure of unworked areas, an Act was passed last May providing for revoking leases or licenses of such areas. This gives much freer scope to the prospector, and, incidentally, indicates a spirit of progressiveness on the part of the Government.

COAL.

Coal mining has been for long and still is the most important branch of the mining industry. Before 1894, the annual sales of coal in the Province never exceeded 2,000,000 tons. In the year 1893, the Dominion Coal Company commenced operations. Since then, with the Nova Scotia Steel & Coal Company as a later heavy producer, the annual sales have gone up by leaps and bounds, until during this current year they promise to exceed 6,500,000 tons; while the gross production may approach 7,500,000 tons.

The Acadia Coal Company, the Inverness Railway and Coal Company, the Maritime Coal, Railway & Power Company, and several smaller concerns, contri-

bute a large share of the total. All are carefully managed and excellently equipped.

Yet there is ample room in the coalfields of Nova Scotia for the investor, particularly for the European investor. Not a few tragedies have been enacted where the giddy promoter and his victim have been the chief actors, and where the property has been abandoned before its merit or demerit was demonstrated. Not a few holdings have been opened that show large promise. And Nova Scotia is so admirably situated, geographically, has such a number of accessible harbours, that her advantages in these respects are supreme.

The vast enterprises that have been established in will, we believe, be a revelation to our readers. The commercial conservation of coal has been carried to a higher point nowhere than in Nova Scotia. Better still, her manufacturers are competing successfully for a share of the trade that is created by the needs of the mining companies.

IRON AND STEEL.

The vast enterprises that have been established in Cape Breton and at New Glasgow by the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company owe their growth in large measure to special conditions. In themselves they have contributed very largely indeed to the development of coal mining, and to the support of growing industrial communities. For the opening of iron ore deposits in the Province they have done more than is generally known, as witness the Torbrook mines of the Canadian Iron Corporation.

One of our leading articles is written by Mr. J. H. Plummer, the vigorous president of the Dominion Steel Corporation. Mr. Plummer, who is obviously no "free trader," states the case for the iron and steel industry in a manner at once convincing and moderate. We would be guilty of painting the lily were we to add to what that article contains. We commend it to our readers most heartily.

GYPSUM.

The potentialities of the gypsum trade of Nova Scotia are enormous. Only a fair beginning has been made. For instance, while this year there will be quarried between 350,000 tons and 400,000 tons, the great bulk of this will be shipped crude to the United States, whence much of it is shipped back to Canada manufactured. The number of manufacturing concerns in Nova Scotia is small, their capacity inconsiderable. The demand for the many commercial products is large and will grow. The supply of high-grade gypsum is, humanly speaking, almost inexhaustible. Here, also, is one of the neglected fields of the Province.

BRICK AND TILE.

Cheap fuel, the best of raw material, an extensive market, and easy transportation are the inducements offered to the brick manufacturer in Nova Scotia. The reports of Dr. Henrich Ries, published by the Ottawa Mines Branch, is amply commendatory. The range of material available is wide, covering practically every grade of clay and shale. Building brick, fire brick, drain tiles, roof tiles, and various kinds of pottery can be produced. China clay, also, has been found in quantity. With the industrial revival that is pending will come a strong demand for these commodities.

MISCELLANEOUS.

Of the score of other mineral products—manganese, copper, tin, antimony, tungsten, etc., etc., space will not permit us to say more than that they have by no means received the attention they deserve. Only sporadic or ill-advised attempts have been made to develop many of these deposits. Others, partly developed, are promising. Several are on the high road to success.

GENERAL.

Properly to appreciate the general conditions that surround the mining industry in Nova Scotia, a personal visit is absolutely necessary. Most Canadian mining men are almost as lamentably ignorant of the Province's resources as is the foreigner. That Nova Scotia ranks first among the Provinces of the Dominion as a producer of coal, of iron and steel, and of gypsum, will be news to many Canadians. Incidentally, also, Nova Scotia easily takes the lead in her output of such minor articles of commerce as college presidents and politicians. These are mostly exported.

And, by the same token, one of the best assets of the Province is the ordinary mining population, a class that has been depleted sadly by migration, but that is still numerous enough to be of major importance. The Nova Scotian miner, properly handled, has the good qualities both of Cousin Jack and of the western hustler. Of course, he has his own shortcomings. The attractions of the river-drive or of the haying season often prove too much for him. But this can be overcome if the mine offers sure employment.

Hardly any country provides such facilities for the technical education of workmen and of mining students. The Technical College at Halifax, and numerous special day and night schools at various centres give practically free instruction in all that appertains, not alone to mining, but to all the common trades. Hence Nova Scotia is creating a supply of trained men to meet her own needs—men who have first-hand knowledge of the country. This fact redounds to the credit of the Provincial Government. Largely instrumental in the organization of the system has been Mr. F. H. Sexton, on whom more than on anyone else has fallen the burden.

. . . .

For this Special Nova Scotia Edition the amount of available material has been embarrassingly plentiful. Despite the fact that all our current news and ordinary departments have been displaced, it has been quite impossible to cover the ground as fully as we might have desired. Many subjects, particularly that of gypsum quarrying, have been, perforce, omitted. Fortunately

HON. G. H. MURRAY,
Premier of Nova Scotia

a very full description of the gypsum industry was published in these columns on December 15, 1911, and January 1, 1912. Other necessary omissions were numerous. Several gold mines and collieries, and not a few other mining enterprises we have had to neglect. Moreover, we have been unable to touch upon transportation and water powers, both topics of the utmost interest. While these will be fully dealt with in future issues, we still regret that the exigencies of space do not permit of their inclusion here.

. . . .

It has been our object, first, to accentuate the fact that the larger mining and metallurgical concerns of Nova Scotia represent the highest phase of technical efficiency. The articles on the practice at the Dominion Steel Company's open-hearth furnaces, and at the steel works of the Nova Scotia Steel and Coal Company, are ample evidence of this. If more evidence be needed, we have but to refer the reader to the descriptions of the power equipment and the new tipple at the plant of the Acadia Coal Company.

Our second object has been to impress our readers with the variety of the Province's mineral resources. There will be found in the following pages, articles on

gold, manganese, coal, iron, china-clay, firebrick, barite. This list, to have been thoroughly inclusive, would have been twice or thrice as long. However, the lesson is there.

. . . .

As stated above, our readers will have an opportunity next spring, to read a thoroughly comprehensive redaction of this issue, published in pamphlet form. In this pamphlet all our involuntary sins of omission will be remedied.

THANKS.

Our requests for articles from those engaged in mining in Nova Scotia met with a singularly prompt and full response. The amount of material available, indeed, became overwhelming, and too much of it must be held over for future issues.

Our especial thanks are due to many individuals. To Mr. F. H. Sexton, much of the credit for the whole issue is due. Without his assistance it would have been difficult, indeed, to have succeeded. We are particularly grateful, also, to Mr. J. H. Plummer, the president of the Dominion Steel Corporation, for his remarkably vital paper on the iron and steel situation; and to the president and officers of the Nova Scotia Steel and Coal Company for their unfailing courtesy and kindness.

Most of all, however, our thanks are due to the Provincial Government. The co-operation of the Provincial Department of Mines has rendered this edition possible.

NOTES.

Our next Special Issue, to appear on October 15, or November 1, will deal with Cobalt, Gowganda, Elk Lake, and South Lorrain.

Circumstances and the unwarranted modesty of the persons concerned conspired to prevent us from obtaining portraits of the Hon. Mr. Armstrong, Commissioner of Mines; Mr. H. Donkin, Deputy Commissioner, and Mr. E. R. Faribault, whose name has long been one to conjure with in Nova Scotian mining circles.

H. B. PICKINGS,
Assistant Inspector of Mines

F. H. SEXTON,
Director of Technical Education

IRON AND STEEL IN NOVA SCOTIA

*Written for The Canadian Mining Journal, by J. H. Plummer.

I.

That the manufacture of iron and steel is a fundamental industry, and that these commodities are among the earliest which any country that has suitable natural resources should seek to produce, is universally accepted, and to this was due the general support given by both sides in Parliament to the granting of bounties in aid of the industry.

In Canada we have the natural resources and during the past ten years, at any rate, have nothing to be ashamed of in the progress we have made to supply our own basic materials, but we are as yet occupying only a small part of the field open to us.

II.

So far as present knowledge of our resources goes, there are three districts in Canada where this industry may be naturally developed. In the Maritime Provinces we have ample coal, of which, among the raw materials used, the largest tonnage is needed. We have sources open to us for the cheap supply of ore by water; and there are good prospects of ore deposits being developed within the Provinces. The larger plants have besides the great advantage of water transportation for the finished products.

In Ontario there is much iron ore, coal in the United States within reach at a reasonable cost, and an excellent market. The raw materials cannot be assembled as cheaply as in Nova Scotia, but there are some counterbalancing advantages in the way of distribution.

In the west, British Columbia has resources which must lead to the development in good time of its iron and steel industries. What there may be in the vast country lying between Ontario and British Columbia it is too early to say.

At present Nova Scotia is the chief centre of the industry, with Ontario following closely in her wake, and it is of Nova Scotia that I have been asked to write.

III.

To do justice to the claim of any industry in this province, one must look back at earlier days. When Confederation was first proposed, a large number of her people were strongly hostile, and it cannot be denied that at first the province did not gain by the change. Before Confederation her trade was mostly in the hands of her own merchants, and Halifax held a strong position as a distributing centre. She levied her own duties, on such articles as under the local conditions were best suited to bear the burden, and she had the whole world to look to for such supplies as she could not or did not herself produce.

After Confederation her trade fell largely into western hands, and she became a customer of the other provinces for most of her needs; flour and other foodstuffs, clothing, boots and shoes, and other things. Her industries were largely undeveloped; she sent little to the west, but men and money; she bought a good deal. She had great possibilities in agriculture, in coal and in fisheries, but in none of these got much benefit from western trade in these earlier days.

Then came the industrial awakening. The stimulation of the manufacture of iron and steel by bounties, the incidental but most important help to the coal industry which this in itself gave, and the development of coal mining by the opening of the markets up the St. Lawrence as the effect of the duty on coal, all combined to give to the Province her first serious benefit under Confederation. I am, of course, speaking of material benefits only; it would be a grave injustice to her people to suggest that they do not value the benefits of another sort which they are proud to share with all Canadians. But citizenship in a great Dominion and the wider national life and outlook which it gives, however greatly to be valued, do not in themselves provide homes or food and clothing for wives and children. Before the coming of the industrial development the young men and women of the province found new homes abroad to an alarming extent, and New England absorbed her citizens by hundreds of thousands.

The growth of such centres as the Sydneys, New Glasgow, Amherst, etc., and the less marked but very important industrial growth elsewhere in the province, have greatly modified all this, and have had an important effect on the life of the province, its prosperity and its public revenues.

The recent census made it clear that, but for the growth of the industrial centres, the population of Nova Scotia as a whole would have shown a decrease, and that there was an actual decrease of the farming population.

Prince Edward Island, which is practically without industries, also shows a decrease. I cannot speak from personal knowledge of the Island, but I am told that her young men are drifting away, that the proportion of unmarried women is increasing, and that it is becoming more difficult to find labour for her farms.

The striking point in this, which applies in some degree to Nova Scotia as well, is that this shrinkage of population has been accompanied by the growth of large and excellent markets at their doors for all that they raise. I am told that the farmers are prosperous, and that the conditions of the whole Island have improved as the industrial centres in Nova Scotia have grown.

There is nothing new in this; Ontario, Quebec, the New England States and other districts have had the same experience. It seems to show that true prosperity, and room and scope for a growing population must be lacking where there are no industries. Men are not all alike, and only a certain percentage in any community take to farming or other work on the land. Many prefer industrial pursuits because of the wider opportunities they give, because of the steady work, the higher wages, the shorter hours, and, most of all, the town or city life with which they are usually identified. Such men will seek new fields of work elsewhere if they do not find these opportunities at home, and their own community can ill afford to lose them.

The duty of Parliament to deal fairly with the claims of the different provinces, with due consideration for their differing needs, will not be gainsaid. No Nova Scotian grudges the unstinted pouring out of money in aid of immigration, of railways, of canals, and of other things for the development of the West. But this province, and to some extent the Maritime Provinces generally, must look chiefly to the development of their industries for their share of the national growth. If, then, it be admitted that this basic industry is one which should be fostered; if the facts I have outlined

*President of the Dominion Steel Corporation.

be considered, and if the several interests of the provinces are to receive justice in the framing of our fiscal policy, I think the claim of Nova Scotia to full consideration for these primary industries of iron, steel and coal, in which she leads, cannot be overlooked.

IV.

As regards the actual condition of the iron and steel trade in Nova Scotia, I should say that from one point of view it is very promising. At all points large extensions are being made to existing plants, and larger production has been reached, or is within sight. These extensions have been entered on in reliance on the willingness of Canadians, of Government and Parliament, to continue a policy of reasonable protection for Canadian enterprise.

From another point of view the condition of affairs is not good. The depression in the iron and steel trade in the United States last year brought Canadian prices to a low level, the effects of which are still felt, and earnings have been poor. The tariff conditions affecting the trade are in many respects unsatisfactory. Its difficulties in that regard have been respectfully laid before the Government; there are low duties on articles which should be made in Canada, such as the larger sizes of structural steel; in other cases, where the duties are in themselves adequate, exemptions make a large portion of the market duty free. The tariff on wire rods, wire and similar products, might have been framed expressly to divert a large part of this important and growing tonnage into foreign hands. There is an annual sum of four or five million dollars paid to foreign workmen in this line alone which should be paid to Canadian workmen. If Canadian makers had this business it would do little more than operate fully plants already in existence, and one is only calling attention to the obvious in saying that full operation is the key to lower costs, to which in this as in other lines we look for ultimate independence of tariffs. I cannot refrain from saying that to give large bounties to establish the making of iron and steel, and with their lapse so to deal with the tariff as to deprive the makers of a large part of their market, is a most inept and wasteful policy.

V.

Free trade would doubtless command the support of most business men if things were equal industrially all the world over, but they are not. No country ever tried to establish its industries and maintain free trade at the same time; certainly not England, or the United States, or Germany, and the more that the competition which the industries in a new country must meet comes from countries where industries are fully developed and specialized, the more need there is of protection at home until conditions have been more equalized.

We hear a great deal about opposition to the tariff among the American people, and we are often told that the public we serve will follow in their train. But we ask, with confidence, for fair play, and fair play demands that the course of the industrial development in both countries, and its relative stage in each at present, should be fully considered. In the United States there has been protection, literally for generations, to an extent far beyond anything dreamt of in Canada; a protection so effective, so far as iron and steel are concerned, that in these lines they now lead the world.

The resentment of the American people is not, it seems to me, directed against duties reasonably necessary to protect their industries, but against excessive duties which impose an undue and unnecessary burden on the consumers. So far as I can judge, most Americans, whatever their politics may be, are firm supporters of such protection as is necessary for the prosperity of their industrial workers, which necessarily includes prosperity for those who employ them. If in dealing with the Canadian tariff this spirit prevails, neither the manufacturers nor their employees will have anything to complain of.

VI.

The production of iron and steel in Canada in a large way began only ten years ago, and while we have had foreign experience to guide us, there is not a branch of the industry in which we have not had to meet our own special difficulties, and work out our own salvation. We have had to organize our staffs, to train our workmen, to deal with ore, coal, limestone, etc., previously untried, to develop efficient means of transportation, and to master our own special problems, and, in most of these matters there is little help to be had from others' experience. We have had to buy—and pay for—our own, and we have still much to learn.

We have, however, made great progress, and this brings me to a point which troubles many reasonable people. They ask such questions as this: "You should by this time be able to make steel at about the same cost as the United States manufacturers; why cannot you secure the market?" Now, one might have to admit that there might be a difficulty even under reasonably equal conditions, but the conditions are not equal.

To take one obvious point first, manufacturers in the United States supply a home market ten or twelve times as large as ours in the mere number of buyers, and relatively much larger still in volume, with some part of our own market and of other foreign markets in addition; they manufacture in large quantities and are able to specialize. All this gives them a great advantage. They could add to their ordinary production a tonnage which would supply us fully, and yet be but a trifling increase of their large output. They can sell it here, if they choose, at its nominal cost or even below it, and still get some advantage out of the business. They could not live on such prices as they usually get in Canada, if the same prices governed their home sales, and the Canadian plants could not hope to succeed if American export prices—below living rates—had to be accepted as a permanent condition. That we escaped without disaster from the serious market conditions last year was due chiefly to the fact that, although so large a part of the trade was attacked, and in many cases secured by United States manufacturers, the tariff and the dumping duties prevented slaughter sales and so secured a portion of the market for Canadian manufacturers.

Passing by other considerations such as the effect of the preferential tariff, and of competition from the Continent; from Belgium, for instance, where the average wages were found a year or so ago to be 85 cents per day, as compared with $2.08 per day at Sydney; I will go on to a second point, not quite so obvious, which is involved in our geographical conditions.

In that portion of the United States which lies near our borders, from the Atlantic to the Middle West, and within easy reach of Canada, in many cases right on the lakes which join the two countries, there are a very large number of iron and steel plants. There is scarcely

business centre in Canada east of Winnipeg which innot be reached at comparatively low cost for transortation from some of these plants, and this appears) be further helped when times are bad by favourable ites of carriage of goods intended for export.

In Canada, on the other hand, the volume of trade ompared to that of the United States is still small, and s plants on a large scale are essential to cheap prouction, there can as yet be very few of them to supply ie home market. It follows that there are many places which these plants can reach only at considerable cost or transportation. Compared with the nearest source f supply in the United States, the home industries are n such cases under a disadvantage, and the duty which Jnited States manufacturers pay is often counteralanced in whole or in part by the extra freight harges which the Canadian products have to bear. This is a natural condition of which Canadians if they re to manufacture iron and steel, must make the best intil more plants are built. A little consideration of he long east and west stretch of country which Canadian manufacturers serve, and of the limit within which such a sum as $2.50 per ton (the duty on pig iron nd steel billets) would carry these products by rail, will show how seriously this question of transportation iffects the value of the duty as a protection to the ndustry.

VII.

I hasten to admit that in all this an excellent argunent for free trade can be found, and that the condiions justify such questions as this: Why should be iot let the foreign manufacturers supply us, since they can and do send us goods at prices at which it does iot pay Canadians, in their present stage of developnent, to make and deliver them?

One answer is that under such conditions we should have no manufacturing industries in Canada, and should never get into a position where we can meet foreign manufacturers on more equal terms; also that we do not wish to be a purely agricultural country, with the limited scope which that condition would offer to our sons, and with no outlet for such of our people as cannot find or do not wish for work on the land. I believe this to be the firm desire of the majority of Canadians; that they wish to see Canada grow along all the lines of national life; agriculture as the mainstay, but balanced and complemented by industries of all kinds natural to the country.

This raises one of the chief issues between protection and free trade, into which I do not wish to enter, but there is another answer of a very practical kind. If we were relying on foreigners alone for our goods we should not get them at low prices. It is because goods are being made in Canada that goods brought in are offered at low prices; but for that fact United States manufacturers would only have to meet European competition in our markets, and the chances are that under ordinary conditions they would exact higher prices in Canada than at home.

It is scarcely necessary to bring forward any argument to support this point, but the case of barbed wire may be mentioned as an illustration. The earlier duties and prices for this article were doubtless unduly high, but in the years immediately preceding the removal of the duty, when a large number of mills were making the article in Canada, competition was strong and prices fair.

In 1896 the Toronto wholesale price was $2.85 per 100 lbs. In 1897 it went as low as $2.20. On January 1st, 1898, barbed wire became free. The American mills thereupon inaugurated a policy of competition at ruinous prices that drove the Canadian mills out of business and secured for themselves absolute control of the market. The effect may be seen from the price; they made it $1.80 in 1898, after that, when the home industry had been killed, it advanced until in December, 1899, it reached $3.60.

Since then nearly the whole of the barbed wire used in Canada has come from the United States, and their manufacturers have fixed the price. Of late there has been keen competition among the American manufacturers and it is entirely due to this condition, whose permanence would be contrary to experience, that the price has been easier. It is quite fair to say, and in keeping with our general experience, that if instead of making barbed wire free a duty of moderate amount had been left, Canadian farmers would, on the whole, have had much cheaper fencing.

Another case that may be mentioned is that of anthracite coal. The duty on this was removed some years ago, because it is not produced in Canada, but the Canadian consumer did not receive the slighest benefit from the reduction. There can be no home competition and the anthracite producers, working together, keep the price at the high level which they themselves fix.

VIII.

The needs of the industry in Nova Scotia are the same as elsewhere; a reasonable revision of the tariff. I have referred hitherto to American competition, but the industry has also to face the preferential duties on British goods, which are in a great degree the controlling factors in Canadian prices. These duties are very low; measured in the ordinary way they represent about 10 per cent. on pig iron, 7 per cent. on billets, and 15 to 20 per cent. on other articles. The average tariff on dutiable articles is about 26 per cent., so that as compared with other things the duties on iron and steel are moderate. Our chief troubles, however, arise from lack of any principle in the fixing of the duties, and from exemptions.

We have in the general tariff, for example, $7.00 per ton on small rolled sections, but only $3.00 on the larger sizes where the tonnage is heavy and the market most important.

Again, the largest users of small sections are the manufacturers of agricultural implements, who are exempt from duty on most of the materials they use. There are similar exemptions in other lines.

The billets from which wire rods are made are subject to duty; the wire rods themselves, in the sizes most commonly used, are free. Wire for fencing is free, the woven fence is subject to duty.

The wire from which barbed wire is made enters free, and barbed wire is free also, although experience has shown that the removal of the duty has not had a beneficial effect on the price paid by the consumers.

These, however, are merely illustrations. What we should have is a reasonable tariff, fairly apportioned, with a sweeping away of all exemptions save where Canadian manufacturers cannot supply the articles. It should not be so high as to shelter careless or ignorant methods, or obsolete and inefficient plant and machinery, but it should be high enough to compensate for the higher wages paid here as compared to Europe, and to

help us to meet the special forms of competition from the United States which I have mentioned above.

With such a tariff a great growth may be confidently looked for, and it should be remembered that while there must be a profit for those whose capital and enterprise make the growth possible, the chief benefit is not to the employer, but to the employed. Even at present, when fire brick and many other things which should be made in Canada are still imported for use in the industry, over 80 per cent. of the cost of making iron and steel in Canada goes out in payment for Canadian labour.

There is ample tonnage to keep much larger plants in operation than we now have, there is enterprise enough to create these if the tariff conditions are made reasonable and are based on principle; there is capital to be had if the existing plants are able to make a proper showing in the way of earnings, and there is a plentiful supply of the raw materials.

Speaking of Nova Scotia in particular the development of the iron and steel business is of vital importance to the growth of coal mining in the province. The prosperity of the province, her ability to provide for educational and other social needs, to build roads and to carry on other public services, is bound up in the growing royalties from her coalfields, and to Nova Scotia, as to the Maritime Provinces as a whole, reasonable tariff conditions for iron and steel are of primary importance.

BASIC SLAG WORKS AT SYDNEY, N. S.

By C. R. Walker, Managing Director Cross Fertilizer Co., Sydney, N. S.

These works have been erected to deal with the basic slag produced as a by-product at the Bessemer furnaces of the Dominion Iron & Steel Company. Formerly this basic slag was so much waste material. Considerable expense was entailed in getting rid of it; but now it is being utilized as a fertilizer, adding materially to the yield of crops to which it is applied and improving old worn-out pasture to a wonderful extent. The works cover an area of over six acres.

All slag produced at the steel works is not of value from an agricultural point of view. Only basic slag containing phosphoric acid in a soluble state can be used for fertilizing purposes. This basic slag is obtained in the elimination of the phosphorus from the iron during its conversion into steel. At the Bessemer furnaces the slag is poured into cars having removable sides. These cars hold from ten to fifteen tons of slag which solidifies after a short time, and they are then run by private railway to the slag works. The sides of the car are removed and a crane is hitched on to the block of slag which is deposited quite close to the grinding mills. These blocks of slag are then broken by a drop ball weighing 3,000 lbs. falling from a height of thirty feet. By this means it is reduced to pieces not more than seven pounds in weight, after which it is loaded into bogey cars holding about 1,500 pounds and run into a hoist and elevated to a large hopper holding one hundred tons.

The slag is mechanically tipped into this hopper from which it is fed by a traveling conveyor to a couple of ball mills. The mills are loaded with a charge of 3,500 pounds of steel balls, each five inches in diameter, and are driven by steam at the rate of twenty-five revolutions per minute. The slag undergoes pounding in the ball mills which reduces it to a rough powder all of which will pass a seive having twelve mesh to the inch . From the ball mills the slag is conveyed to a tube or finishing mill. The tube mill is a steel cylinder, thirty feet in length, containing ten tons of steel balls of assorted sizes ranging from three-quarters to two inches in diameter. The slag passes in at one end of the mill, which is driven at the rate of thirty revolutions per minute and the pounding of the steel balls completes the process of grinding. The finished product finally passes from the tube mill ground so fine that 90 per cent. will pass a 100-mesh sieve, that is a sieve having 10,000 holes to the square inch. From the tube mill the ground slag is taken by an overhead conveyor to the warehouse where it is bagged and weighed automatically and stored until required by the farmers for application to their land in the autumn or spring. The mills have a capacity of 10 tons per hour, and, working day and night, can easily turn out 1,000 tons per week.

Works of Cross Fertilizer Co. Sydney, N. S.

As slag is not in consumption all the year round, very large storage capacity is required and the Cross Fertilizer Co., Limited, the proprietors of the basic slag works, has had to erect a warehouse 365 feet long by 150 feet wide, capable of holding 12,000 tons of the finished product. A railway runs through the entire length of the warehouse and, when necessary, 2,000 tons can be loaded into railway cars in 24 hours. The mills are driven by a 500-h.p. engine supplied by Fullerton, Hodgart & Barclay, Ltd., of Paisley, Scotland, to which steam is furnished by two Lancashire boilers by Penman & Co., of Glasgow, Scotland. The entire cost of buildings and plant amounted to $250,000.

THE DOMINION COAL COMPANY, LIMITED.

(Written for The Canadian Mining Journal, by F. W. Gray.)

The operations of the Dominion Coal Company were ully described in a series of articles which appeared ı this journal in 1908, and since that time the pro;ress of the company has been closely followed in the orrespondence column of the Journal. A detailed acount of the Coal Company's great industry would herefore be out of place, and the following account f the status of the enterprise is intended to be nothing nore than a brief summary.

Since the incorporation of the Dominion Coal Company in 1893 it has passed through many vicissitudes, ut these have been concerned chiefly with changes of inancial control and management, and are of more nterest to the frequenters of 'Change than to the readers of a technical periodical. The record of the industry itself has been one of consistent and steady growth. There have been hindrances from accidents and labour troubles, from which no mining company can hope to be entirely free, but there are not many companies engaged in the more or less speculative occupation of mining coal that are able to show so consistent a record of development as the Dominion Coal Company.

The amalgamated collieries of which the Dominion Coal Company became the possessor nineteen years ago were eight in number, six of them being in the Glace Bay Basin. The other two collieries were situated in the Morien Basin and at Old Victoria. These two last-named mines were closed down, and the energies of the company were concentrated on four collieries in the Glace Bay field, namely, Old Bridgeport, Caledonia, and Reserve collieries on the Phalen seam, and International Colliery on the Harbour Seam. In 1893, therefore, the Coal Company had four collieries at work on two seams, with an output capacity of 800,000 tons per annum. In 1912 the company had sixteen collieries, operating on seven seams, with an output capacity of 4,500,000 tons. The progress of the company is even greater than would appear from the foregoing statement, for the reason that the original four collieries operating in 1893 have been almost entirely remodelled, and it is well within the mark to state that, with the possible exception of International Colliery, every one of the company's mines has been developed and equipped in the period since incorporation.

Every record of outputs in the Coal Company's history has been easily distanced during 1912. For the seven months ending 31st July, the Glace Bay Mines of the Company produced 2,530,000 tons, comparing with 2,300,000 tons in the first seven months of 1908, the best previous year. Averaged over the seven months, the output so far this year, has been over 361,000 tons per month, a very consistent performance, all things considered. In July the output was 410,000 tons, this being the first occasion that the collieries have produced over 400,000 tons in any one month. It is probable that the August output will exceed 420,000 tons.

The Dominion Coal Company owns areas in each of the four basins into which the Sydney coalfield is geologically divided. Mines Nos. 1 to 10 are operating in the Glace Bay field, mines Nos. 12 to 16 are situated in the Lingan-Victoria field, and mines Nos. 21 and 22 are working in the Morien field. Between No. 21 colliery and No. 16 colliery is an intervening distance of over ten miles, as the crow flies. No collieries have as yet been opened on the areas in the Point Aconi district, adjoining the areas of the Nova Scotia Steel & Coal Company, but these will come in due time. When this takes place, the Coal Company's operations will embrace a district reaching thirty miles in length, and running inland seven miles, covering indeed the whole of the coal-bearing measures from the eastern outcrop of the Morien Basin to the termination of the coal-measures by Cape Dauphin on the west. The areas controlled by the Dominion Coal Company cover the most desirable portion of the Sydney coalfield, and in comparison the outlying areas not owned by the Dominion Coal Company are small in extent, and contain seams of distinctly inferior quality.

The Glace Bay collieries are linked together by the Sydney & Louisbury Railway, which has at its two extremities the two best shipping ports in the Island of Cape Breton. Louisburg is an ice-free port, and is

New Loading Pier, Sydney Harbour.

largely used in the winter during the period that Sydney Harbour is closed. The two ports are so situated as to enable coal to be shipped all the year round, with but little interruption. During the drift-ice season a succession of north-east winds will block the entrance to Sydney Harbour, but the same wind will clear the fairway of Louisburg Harbour, and vice-versa a south-east gale will block Louisburg and clear Sydney Harbour. Drift ice is the only serious hindrance to navigation in Cape Breton waters during the winter. The harbour-ice is very easily broken up, and presents no insuperable difficulties. Except on very exceptional occasions, therefore, the Dominion Coal Company is in a position to ship coal into vessels the whole year round. The main line of the Sydney & Louisburg Railway is 40 miles long, and its various branches and sidings cover an additional 70 miles. The railway has an excellent roadbed, an absolute necessity when it is considered that between 400,000 and 450,000 tons of coal and freight per month are shipped over this line.

On Sydney Harbour the Coal Company has at the present time three shipping piers. One of these piers is now getting old, and will probably be shortly dis-

mantled. A new pier is in course of construction, and will be completed for operation by the end of the year. This pier will accommodate the largest freighters at present afloat.

For the 1913 season the company will have in Sydney two modern loading piers, capable of berthing three large steamers at one time, and of handling up to 40,000 tons of coal every twenty-four hours. The largest coal carriers afloat will shortly fly the Black Diamond flag, as the "Glace Bay," and the "Bridgeport," each of 11,000 tons dead weight capacity, are expected in Sydney during September and October of this year. These vessels are specially constructed for speedy loading and discharging of coal, having large unobstructed holds, into which the coal can pour without any necessity for trimming. In addition to the 11,000 tonners the company has on long-term charter a number of freighters such as the "Kamouraska," the "Helvetia," the "Wabana," "Lingan," etc., all designed for the coal-carrying trade. These vessels will average about 8,000 tons deadweight capacity.

At Louisburg the company has a shipping pier, equipped with special storage pockets and appliances for the loading of slack coal.

The company has very completely equipped discharging plants at Hochelaga and Windmill Point near Montreal, and owns valuable wharf and terminal property at Three Rivers and Quebec. At St. John, N.B., there is a discharging plant, to which large additions will shortly be made. The company also owns some of the most valuable property on the water front at Halifax, and it is expected that a modern discharging plant will be erected there in the near future.

The geographical exigencies of the Dominion Coal Company's market have made them almost as much a transportation company as a mining company. From the foregoing statements it will be seen that the company controls its own railway, freighting and passenger steamers, and discharging plants, which are placed at points enabling the company to supply coal to the whole of Canada from the Maritime Provinces to the Great Lakes.

The mining practice of the company has kept pace with its growth in other directions. Less than ten years ago naked lights were used in the greater portion of the company's mines. To-day, naked lights are not used, except in the very early stages of mine development. With the exception of one colliery, where gas is not met at all, the collieries use a safety lamp which is securely fastened by a magnetic lock that can only be opened by a powerful magnet on the surface. Relighters are used underground, by which an extinguished lamp can be relit with absolute safety without the necessity to open the lamp.

The blasting of the coal is under the closest supervision, and wherever it is considered that danger exists, only high-grade explosives are used, fired by a detonator and battery. In dusty places the coal face is regularly sprinkled, and the long ranges of air pipes underground conveying compressed air to the mining machines and engines, can be turned into water mains at short notice.

The company has paid considerable attention to fire protection. Each colliery has a trained volunteer fire brigade, and wherever possible, a system of water hydrants. Each brigade is equipped with sufficient hose, and at some of the collieries small chemical fire engines are provided. Many hundreds of hand chemical extinguishers are distributed throughout the colliery buildings and other departments of the company's operations, and in the underground workings of the mines.

For more adequate protection against underground fires, and as provision against the effects of a mine explosion, the company has provided a rescue station near No. 2 colliery, equipped with 35 sets of Draeger apparatus, motor-driven oxygen refill pump, two "Pulmotors," stretchers, electric hand lamps and first aid appliances. A number of live canaries are also kept here. If the necessity should ever arise, these would be used to test the life sustaining quality of the mine air after an explosion of fire. In addition to the equipment at the Central station, sufficient sets of apparatus are distributed at the outlying collieries. A new substation has recently been opened to serve the Lingan collieries, equipped with ten apparatus, refill pump, "Pulmotor," and other necessary accessories. At the central station a smoke chamber is provided in which the teams practice weight-lifting and other strenuous exercise in thick smoke and high temperature. The work of training men has now been in constant progress for the past four years, and the company has now a large body of trained men on whom they could rely for good service with the Draeger apparatus. A smoke-chamber will also be provided for the Lingan substation, and practising will be carried on at both points. The Springhill Mines of the company have been provided with an equipment similar to that of the Lingan station, and a rescue station is in course of construction at that place.

So far, no occasion for the use of the Draeger equipment has arisen at any of the mines of the company, but should the necessity unfortunately arise, the company will not be open to the reproach that it did not make proper provision.

By the beginning of November the company will have in operation a Baum coal-washer, capable of dealing with 120 tons of slack coal per hour.

New Baum Wash Plant.

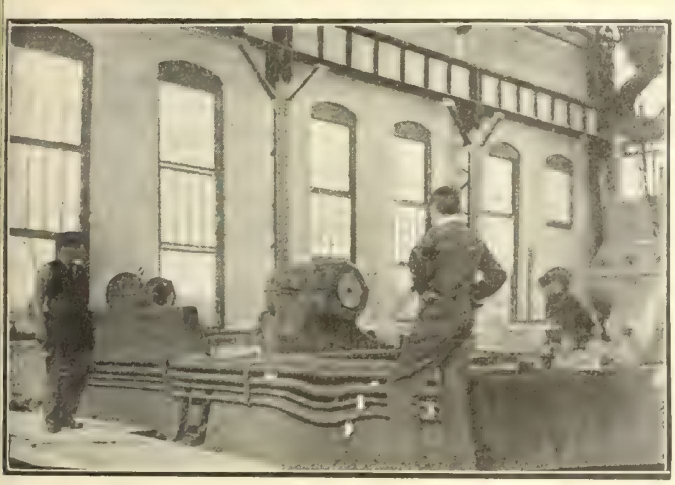
This is the first Baum washer to be erected in America, but in Europe, where a large number are in operation, the Baum washer is regarded as one of the best types. In addition to the washery proper, storage pockets to hold 6,000 tons of washed product, will be provided. The wash-plant buildings are all substantially constructed of concrete, brick and steel, and the installation of the plant has entailed a very large expenditure.

The Dominion Coal Company is fortunate in possessing coal seams so clean that the product of the mine needs little or no preparation, but whatever may be the nature of the impurities in a coal-seam, they tend to concentrate in the "minings" and the slack coal. By treating the slack coal in the new washer the company will obtain a clean, dry, lustrous product which should be in great demand. There will be no waste. Nothing but the impurities in the slack will be allowed to escape. The fine "slurry" or "schlamm" will be retained and used to fire boilers. The plant will be

perated by electric power, and will use only a com- aratively small amount of water in the washing pro- ess.

The company has effected great economies in the enerating and transmission of power. So far as it is ossible no fuel is used to raise power except slack oal and the refuse from the picking belts, and as will e seen later, the company is endeavouring to effect urther economies in the utilization of refuse fuels and lack coal.

The greatest change around the collieries in recent ears has been the gradual introduction of electric ower in place of steam, and the tendency is now to liminate all steam around the newer collieries, except or the purpose of heating buildings. About four years go the company installed a central electric power gen- rating station at No. 2 colliery, consisting of three 500 ilowat units, to which was added two years ago a ,000 kilowat exhaust steam turbo-generator. There is ow in course of construction another and larger gen- rating station at Waterford Lake, situated a few miles to the rear of the new collieries at Lingan.



Interior Waterford Lake Power House.

The new station will contain two 2,000 kilowat units, having a momentary overload capacity of 4,000 kilowats. Turbine driven generators are to be used, taking live steam.

The boiler-plant is worthy of special mention. It consists of three Bettington boilers, the first of their kind to be erected on this side of the Atlantic. The boiler consists essentially of a vertical fire brick lined chamber surrounded by a circle of vertically arranged water-tubes, on the outside of which superheater tubes are coiled spirally..

The fuel is reduced to dust by a pulverizer, and is injected into the fire-chamber by a blowing fan, being consumed in a vertical flame 20 feet in length. All the combustible matter in the fuel is said to be consumed and the residue is an irreducible vitreous slag. The fire-brick walls of the combustion chamber are fused together by the intense heat, and the waste of the walls is renewed by the deposition of the liquid slag. It is stated the combustion-chamber walls require no renewal, but are automatically kept at the same thickness by the deposition of the liquid slag. The bulk of the slag, of course, falls down into the ash-pit below, and compared with the ashes from an ordinary hand-fired boiler, the quantity is small. It is claimed these boilers will give an efficiency not given by any other boiler on the market, and the company hopes to effect a considerable economy, not only from the increased efficiency, but from the utilization of inferior fuel.

The power generated at the Waterford Lake plant will pass into the main transmission line, in electrical connection with the No. 2 plant, and will feed all the collieries from No. 21 colliery at one extreme to No. 16 colliery at the other, and sufficient current will be generated to provide for projected new collieries in the Lingan district.

Bellington Boilers Under Construction, Showing Vertical Tubes and Superheaters.

At No. 14 colliery a permanent electric hoist was put into operation at the beginning of August, so that the entire equipment of this colliery is electrically operated, including air compressors, coal hoist, ventilating fan, bankhead machinery, screening plant and underground pumps. When completed Nos. 15 and 16 collieries will be similarly equipped, and the only steam used will be for heating purposes in the winter.

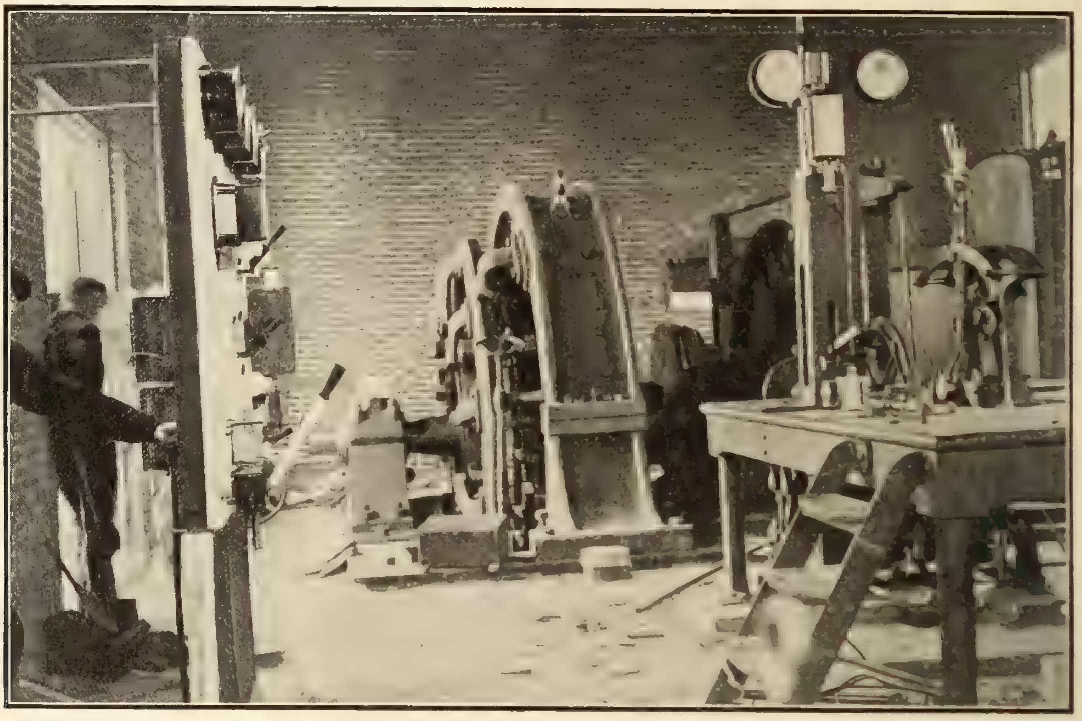
Nos. 21 and 22 collieries will also be electrically operated, the transmission line having been run from No. 2 colliery, distance between five and six miles. The electrically driven air-compressors and hoist are both on the ground.

When the electrical equipment now being installed is completed, the Coal Company will have five large collieries entirely operated by electric power, in addition to which the bulk of the screening machinery, pumps, and ventilating fans at the older collieries has for some time past been electrically driven.

So far as the underground use of electricity is concerned the company has confined itself to motor-driven pumps and haulages, placed in steel and concrete lined houses, and they have not introduced electricity at the coal face, nor used trolley haulages such as are often met with in the coalfields of the United States.

The population directly and indirectly dependent on the Dominion Coal Company's operations is very large, and it is a significant fact that practically the entire increase of population in Nova Scotia, as shown by the last census, is accounted for by the increase in the population of Cape Breton. In Cape Breton Island the workpeople of the Dominion Coal Company number between 8,000 and 9,000, of which number some 6,000 persons are employed in and about the mines, the remainder being employees of the railway and auxiliary departments.

As most of the Company's collieries have been placed in clearings of the original forest, the problem of housing the workmen has been a most serious one, and has necessitated an expenditure of large dimensions. The company owns about 2,100 single dwellings of varying grades, six large workmen's hotels, and a number of boarding houses and shacks. The miners' cottages containing four rooms rent at between $6 and $7 per month. The houses now being built at the Lingan collieries have four rooms and a kitchen, with a verandah in front. Each house has a good-sized plot of surrounding ground sufficient for garden use. The company rents to the workmen houses at from $7 to $8 per month, for which private landlords in the vicinity obtain from $10 to $15 monthly.



Siemens Bros. Electric Coal Hoist, No. 14 Colliery.

The Dominion Coal Company Employees Benefit Society was incorporated in July, 1910, being a consolidation of the Miners' relief societies which have existed in one form or another at the Cape Breton collieries for some thirty years past. This society now numbers over 10,000 members—the Springhill employees being included—and is making good progress. The relief paid covers both sickness and accident, in fact any disability not arising from improper or immoral conduct. The indemnity paid is $6 per week for 26 weeks, then $3.50 per week for a further 26 weeks, followed by $2.00 per week for two years. A widow receives $8.00 per month for five years, and $3.00 per month for each child up to the age of fourteen years.

[Editor's Note:—Mr. F. W. Gray, the author of the above article, is our Nova Scotia correspondent. Of his frequent contributions to these columns this is one of the best.]

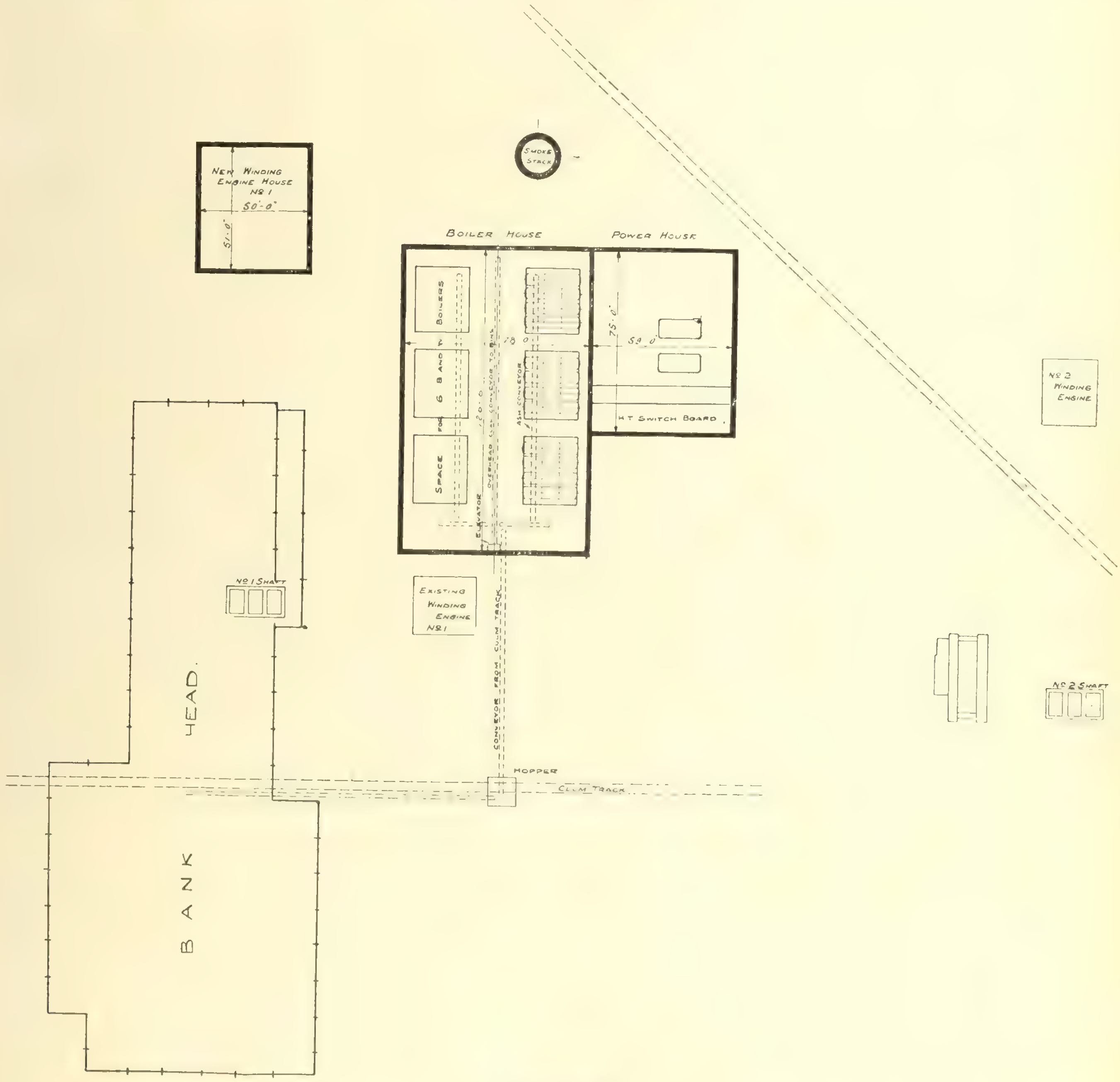
A MODERN POWER PLANT

Written for the Canadian Mining Journal by T. Forster Courthope.

In the following description of the Acadia Coal Company's power plant, together with a general outline of the machinery for which it was put down, no attempt is made to treat the matter exhaustively, but at the same time no detail is omitted which might prove interesting to the reader.

The company's power station is situated about $1\frac{1}{4}$ miles southwest of the town of New Glasgow, Nova Scotia, and is in close proximity to the East River. It is almost an ideal place for a power station, being within easy access to a plentiful supply of water. The Allan Nos. 1 and 2 shafts are in close proximity to the power house and preparations are being made at the former to deal with a large quantity of coal. Of the bank arrangements something will be said later. The company also own what are known as the Albion, Vale, and Acadia mines, all of which are worked by means of stopes. The Allan and Albion mines are, up to the present, the only ones where electrical developments have taken place, and it is proposed to confine this article to these.

The turbine sets, of which there are two, are placed in a very substantial, well lighted, and roomy brick building of ample proportions, space being left at the west end for an additional 3,000 k.w. set when occasion demands. The high tension switchboard at the east end is situated about eight feet above the level of the main floor, access to the front of the board being by



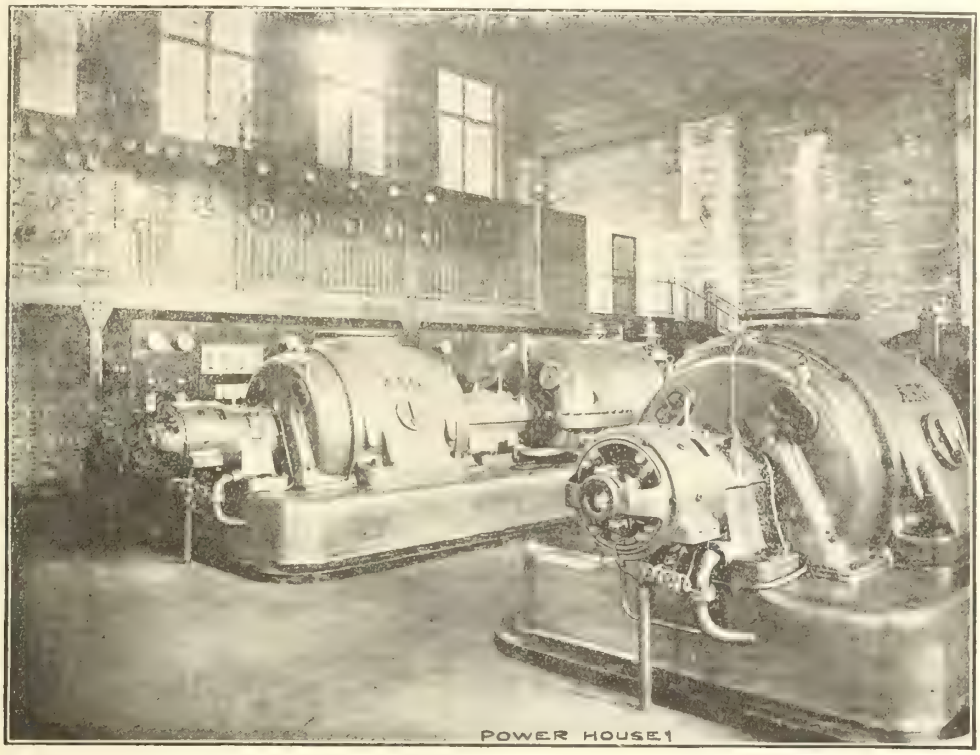
General Plan

means of a gallery running the full width of the building, with a suitable stairway on the left side. The low tension switchboard is placed on the main floor immediately in front of the high tension gallery. A traveling crane capable of handling the heaviest pieces, is placed across the building and capable of traversing the full length. Immediately adjoining, and on the south side of the power house, is placed the boiler house in which are installed six 450 h.p. Babcock & Wilcox boilers, these boilers are placed next to the division wall separating the boiler house from the power house. Opposite the existing position of the boilers there is sufficient space for an additional six boilers when the plant is increased. Now that a verbal sketch of the plant has been drawn we will go on to describe it in detail, commencing at the turbines. These are of the now well-known Curtiss type and may be described as impulse turbines with pressure stages, these stages being subdivided in velocity stops as required. They are of 1,500 k.w. each unit and were constructed by the Allegemeine Electriciate Gesellschaft, of Berlin, rated to work at a steam pressure of 150 lbs. per square inch, with a total superheat temperature of 300° C., the revolutions per minute being 3,000. It is perhaps interesting to note that under test the steam consumption was found to be 14.4 and 14.78 lbs. per kilowatt hour. In the basement immediately under the turbines, are placed the condensers, these are of the usual cylindrical surface condensing type. The air pumps are placed sufficiently clear of the condensors to ensure accessibility. These pumps are of the reciprocating type, coupled direct to a 17.5 h.p. motor taking 27 amps. at 525 volts., and running at a speed of 236 revolutions per minute, they sustain comfortably a vacuum of 27 in. under full load. The centrifugal circulating pumps are direct coupled to an induction motor of 75 h.p., taking 77 amps. at 525 volts, and running at a speed of 975 revolutions per minute. These pumps are situated on the banks of the East River and are about 310 yards from the condensors. Their capacity is about 5,000 gallons per minute, against a head of 42 feet. Metallic starting resistances are used on these motors owing to the exposed position of the pump house. The liquid starting type are unsuitable on account of the severity of the winter frosts. In connection with the condensor the usual auto-atmospheric valves are fitted to the exhaust pipes allowing the exhaust to escape to atmosphere, in the event of a condensor failure. The generators are also by the A. E. G., and have as previously stated, a capacity of 1,500 k.w. each at cos. p. 8, 3,150 volts, 344 amps. per phase, frequency 50. These generators are of substantial build and well designed. The exciter armatures are mounted on the same shaft and have no separate bearings. The exciter frame is bolted to a flange on the end bearing pedestal and fixed in position by an alignment ring. The cable connections to the switch boards are arranged underneath, and at the exciter end of the generators, heavily insulated and steel armoured cable being employed. Current is led to the collector rings by copper brushes, the exciting voltage varying according to the load. The maximum allowable voltage is 110, these low values are chosen to keep the voltage low through the slip rings, moreover it obviates the danger of racing.

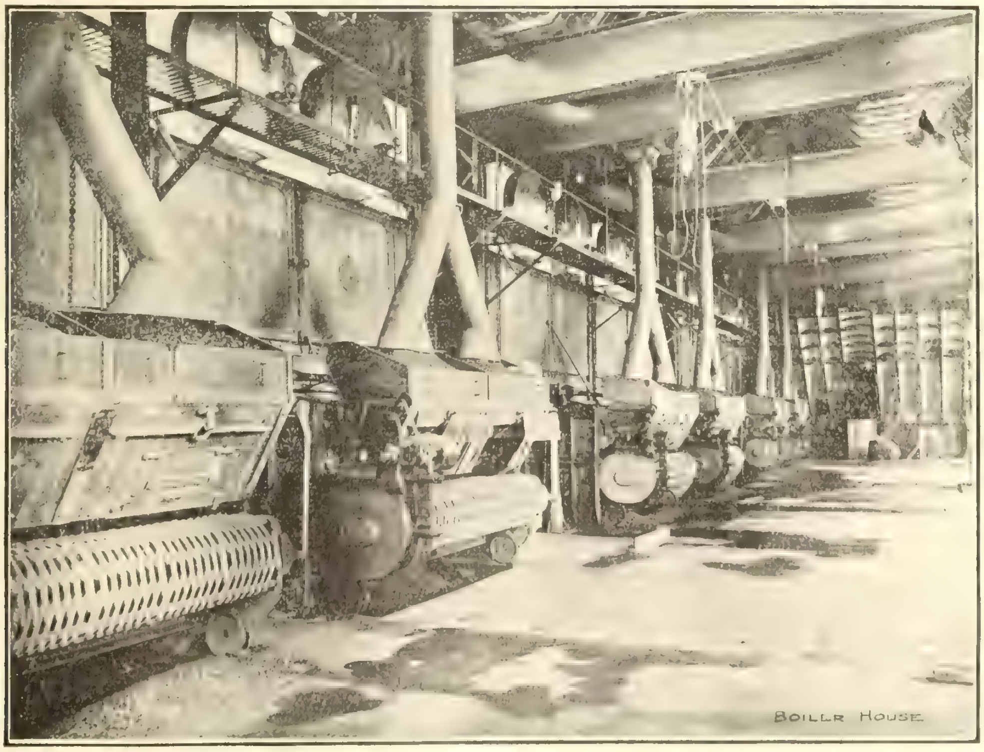
General View, Albion and McGregor Bankhead.

The generators are of the entirely enclosed type. Fans are provided on the ends of the rotors for cooling purposes. They produce a pressure in the spaces enclosed by the stator end guards which forces the air through the air gap between the rotor and stator and also in a greater quantity through the air passages in the iron core. The air flowing through the machines can only travel in a predestined way and all parts of the generators, particularly the windings are uniformly traversed by the air currents. It is obvious that any impurities contained in the air would in time be deposited in the air ducts and passages of the generator, to avoid

this, the air is drawn through an air filter. These air filters consist of a permeable material which is sewn together in the form of pockets which are stretched on a wooden framework, the whole being mounted on angle iron frames. The number of these frames are varied to suit the required quantity of air, the regulation being arranged in such a manner that the pressure drops amount to a few tenths of an inch water gauge. This material is cleaned when required by means of a vacuum cleaner. From 1,000 to 7,000 cubic feet of air per minute is required for cooling purposes, the quantity being determined by the load on the machine. The induction side of the filters is distinctly shown on the photograph, the eduction duct being just visible above it.



Power House.

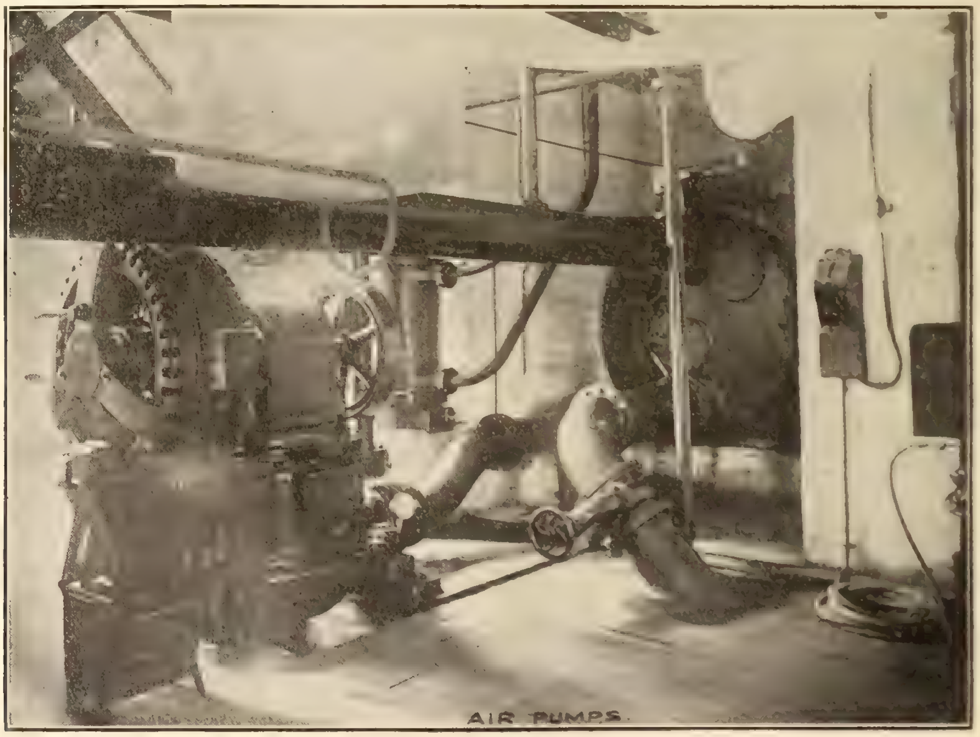


Boiler House.

The main switchboards are in black marble and con-

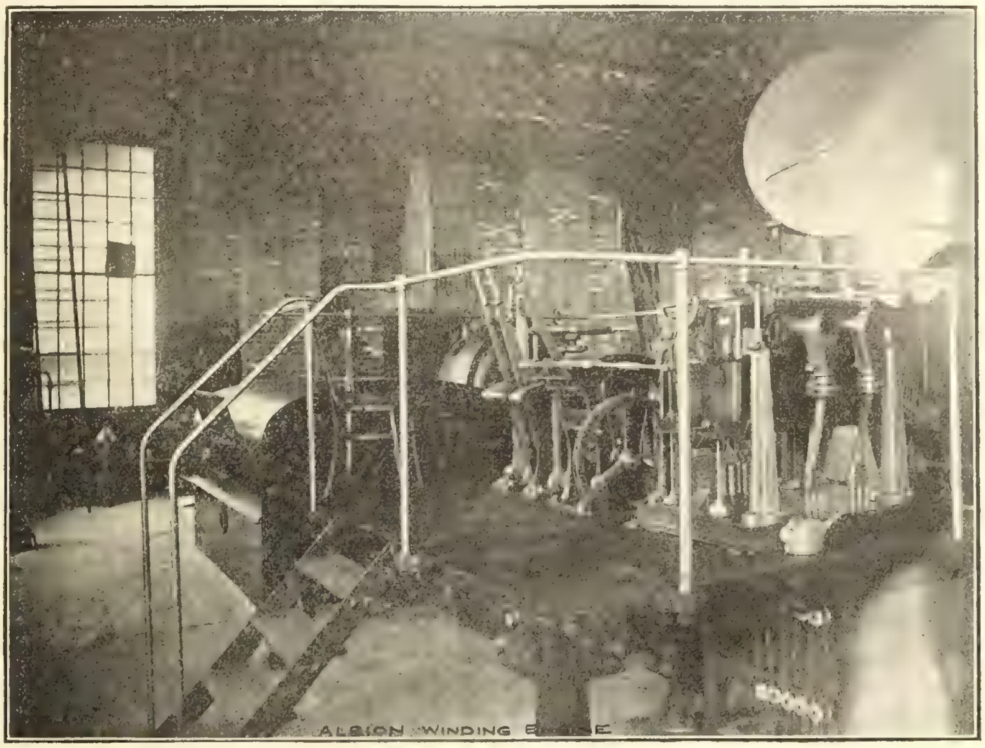
sist of fifteen panels. The main distributing leads consist of round copper bars with concentric couplings, this makes a very real workmanlike job, and is very accessible. The current and potential transformers are placed immediately behind the H.T. panels, and are housed in concrete cells, the secondary leads from these transformers being lead to their respective instruments in small iron rectangular cases. The whole of these connections are arranged in a very systematic manner and strikes one with a feeling of almost overpowering orderliness! In front of the cells perviously mentioned are placed an additional group, these contain the main control switches, which are, of course, oil immersed. Each of the main switches is supplied with two maximum current release coils, and are set to automatically cut out the switch when a certain pre-arranged current passes through them. In connection with the tripping gear of these switches there is an arrangement so that

General View of Plant, Acadia Coal Co.

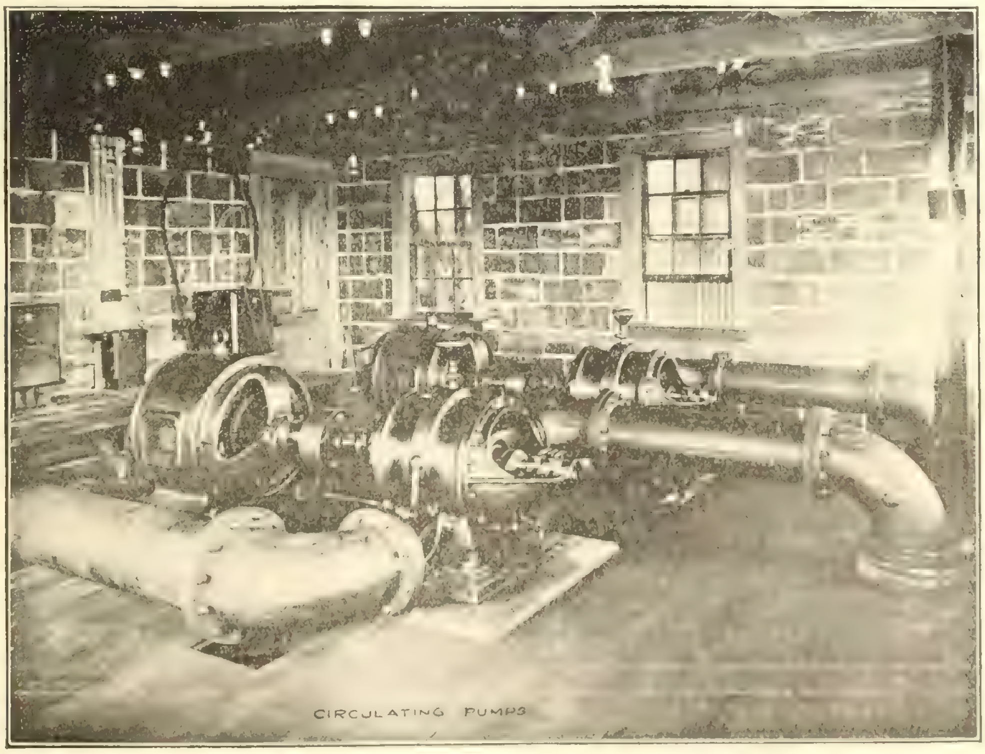


Air Pumps.

when the switch trips a red lamp is lit, this light being placed in prominent position on the switchboard so as to be observable by the engineer in charge. The main generating control panels are fitted with the usual apparatus for the control of the exciters, exciting currents, syncronising for parallel running, etc. Provision is made so that in the case of one exciter failing, another can be used immediately. Adjacent, and to the right of, the main control panels is mounted a "Tirrell" regulating apparatus. These are too well known and beyond the scope of this article to warrant a description here, but at the same time, it may be interesting to note that in conjunction with this apparatus there is connected an ingenious signalling arrangement. When a heavy load is thrown "on" or "off", the signal is given visually by coloured lamps, and at the same time acoustically, by means of bells. Their importance is obvious. Two of the panels on the H. T.

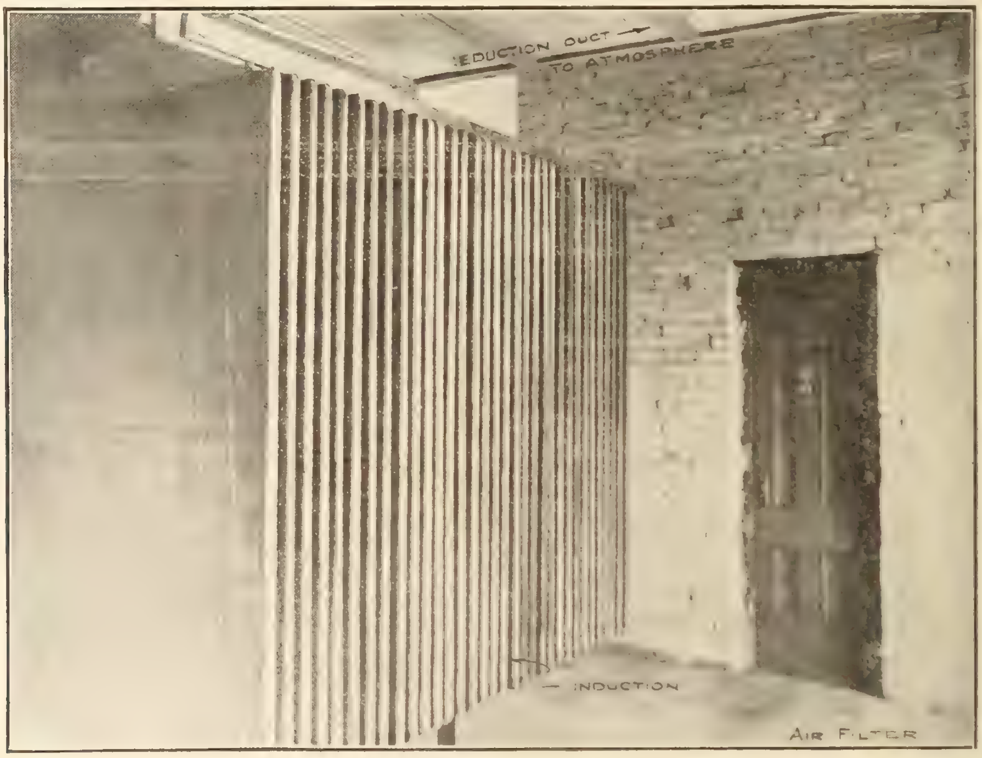


Albion Winding Engine.



Circulating Pumps.

board are for the control of the primaries of the main transformers. These transformers are placed in a special room in the basement of the building and are of the oil cooled type. They have a capacity of 350 k.v.a. (killowatts, volts, amps). and are supplied with a current of 62.2 amps at 3,150 volts, which is transformed to one of 3.86 amps at 525 volts. This secondary current is conveyed to the low tension switchboard. This switchboard is also in black marble, and consists of nine panels. These panels control all the various auxiliary motors for the condensing plant, screens, crusher, carpenter, machine shops, etc., as well as the lighting for the plant and part of the town of Stellarton. H.P. current at 3.150 volts is transmitted by one and a half miles to the Albion mines, by three core cables specially insulated, lead covered, and armoured with two layers of steel band, their size being three inches diameter by 120° m.m.. These cables are laid in duplicate to ensure an uninterrupted service.



Air Filter.

Boiler House.

The installation consists of six 450 h.p. Babcock & Wilcox water tube boilers, each having a grate area of 108 square feet, and a heating surface of 4,510 square feet. These boilers are fitted with superheaters having a heating surface of 1,320 square feet, and giving a total superheat of 300°C. The chain grate stokers are driven by a 12 h.p. steam engine, and arrangements are being made to put in an electric motor as a stand by. The feed water after passing through a Webster "Star Vacuum" feed water heater, is led to two Wier direct acting feed pumps having two 13½ inch diameter steam cylinders and 10 inch diameter plungers by 24 inch stroke, the duty being under full load at the rate of 8,500 gallons per hour.

The coal and ash handling appliances are of a very complete nature and have been eminently satisfactory since their installation. The outline drawing shows the approximate positions of the conveyors, and is self-explanatory. It may be of interest to give the power of the motors used, therfore the following particulars are given: Overhead coal conveyor, 15 h.p., 500 volts, 750 r.p.m.; conveyor from railway to crusher, 10 h.p., 500 volts, 750 r.p.m.; conveyor for ashes, 10 h.p., 500 volts, 750 r.p.m.; crusher, 35 h.p., 500 volts, 750 r.p.m.

Screening Plant.

To the south of the boiler house a modern bankhead has been erected with a screening plant complete, designed to deal with 3,000 tons per day. The headframe is a very fine structure giving one an idea of great strength, without undue weight. The pulleys on this headframe are not yet in position. The company are now putting in the foundations for a modern steam winding plant, the position of which is shown on the plan. The coal from No. 2 shaft is brought to No. 1 shaft by means of a car haul, and then elevated to the level of the new bankhead. There are at present single deck cages both Nos. 1 and 2 shafts. It is intended to draw all the coal at No. 1 shaft as soon as the new winding engine is ready. Four deck cages will be installed for the purpose.

The arrangement of the screening plant is as follows: The boxes gravitate from the hoist and No. 1 shaft cage, and pass along to the automatic tipples, after being unloaded the coal is weighed, and then passes over moving bar screens on to the jigging screens. The first screen, over which the lump coal passes, is perforated with 1¾ in. diameter holes, through these holes pass the nuts and slack, this in turn is deposited by means of a shoot on to a Zimmer conveyor which carries it across the building to an elevator, this elevator deposits the material on to a knocking screen with a half inch wire mesh, the nuts pass over this screen into the cars by means of a shoot, the culm passing through the screen being deflected by another shoot and thence to

the cars. The picking belts are fitted with rising and falling jib ends. These belts are 54 feet long by 5 feet wide.

The motors used in addition to those already mentional up to the present time, at the Allan shafts are as follows Machine and smith's shop, 25 h.p., 500 volts, 750 r.p.m. carpenters, 25 h.p., 500 volts, 750 r.p m. two underground pumps, five stage Rateau centrifugals, head 1,040 ft., gallons per minute 550, h.p. of motors 300, r.p.m. 3,000, volts 3,000.

Albion Mines.

There are two slopes at these mines, namely the McGregor and Albion, the pitch averaging approximately 23 degrees, the McGregor being 272 feet long from No. 5 level, and the Albion 2,800 feet. The boxes are hauled up these inclines by electric winding engines. These engines are in duplicate and are each placed in engine houses measuring 40 feet by 41 feet. The drums are 9 feet diameter by 4 feet wide, driven by double reduction machine cut gearing from a motor of 320 h.p., running at 500 revolutions per minute and taking 3,000 volts. Fifteen 1-ton boxes are to be run at one time on these slopes, at a speed of 600 feet per minute. Two electrically rope driven Walker air compressors, running at 120 revolutions per minute and giving 1,600 cubic feet of air per minute at 100 lbs. per square inch, are installed, one running on night load and the other on day load. The motors are 320 h.p. each, running at 500 revolutions per minute and taking 3,000 volts. It is interesting to note that these motors are interchangeable with the winding motors. Underground there are placed two Ratean 7-stage centrifugal pumps with a capacity of 550 gallons per minute against a head of 1,480 feet, direct coupled to 440-h.p. motors taking 3,000 volts at 3,000 revolutions per minute. There are at present under construction two Capell fans, 12 feet 6 inches diameter by 4 feet wide, with a capacity of 100,000 cubic feet per minute, running at 215 revolutions per minute with a $5\frac{1}{2}$-inch water gauge. These fans are to be rope driven by motors of 150 h.p. running at 750 revolutions per minute, the voltage being 3,000. These fans are for ventilating the McGregor and Albion mines.

The screening plant for the Albion and McGregor mines is almost the same as that described for the Allan shaft and it is not proposed to give any further description here; at the same time perhaps some idea of the electric motors installed to deal with the work, would not be out of place.

Motors Used For	H.P.	R.P.M.	Volts
Main Picking Belts, Screens and Zimmer Conveyor	45	750	500
Box Car Loading Conveyor and Elevating Gear for Picking Belts	25	"	"
Car Haulage (1)	25	"	"
Car Haulage (2)	25	"	"
Creeper	10	"	"
Knocking Screen	10	"	"
3 Down Car Hauls (3)	10	"	"
Trip Hauls (4)	10	"	"
Main Tipples	10	"	"
Tipples, House, Stone, Coal and Refuse	10	"	"

Remarks.

(1) Main car haulage from McGregor to Albion.
(2) Albion full car haulage.
(3) Albion side.
(4) One motor for Albion and one for McGregor.

In addition to the above motors there is a 45 h.p. installed for driving machinery in the carpenters and machine shop.

The substation, containing the switchboard for the motors and feeder cables, also the transformers, is built of hollow terra-cotta blocks, the building measuring 57 feet by 27 feet.

There are two transformers in the substation transforming current from 3,150 to 525 volts, the lower voltage being used for the motors previously mentioned. A separate cable is run from the substation to each H. T. motor, each having a distributing panel controlled by an automatic relay switch with time limit. The L. Tension panels have an automatic switch with overload and no voltage release. There are several spare panels fitted to the switch board for future developments.

The whole of the power plant is of an up-to-date nature and no expense has been spared to make it efficient. The Acadia Coal Company expect to draw a large quantity of coal from its mines in the near future, and there is no doubt that the expense incurred in laying down this very fine plant will be more than justified in a very short space of time.

[Editor's Note:—Supplementing this article will be found another describing fully the new bankhead, which was constructed entirely in Nova Scotia.]

THE NEW "HARMET" FLUID COMPRESSION PLANT OF NOVA SCOTIA STEEL AND COAL COMPANY, LTD, AT SYDNEY, MINES, N.S.

Written for The Canadian Mining Journal.

Nowadays we frequently find railway and other disasters explained as due to the failure of some part of the equipment which is composed of steel. The offending member may have been a steel rail, axle shaft, connecting rod or any vital part of the machine. The opinion undoubtedly exists that steel is liable to unaccountable failures. This opinion is not new. In the early days of steel, when it was fighting for its existence against iron this was the cry. Since then steel has proven its worth and superiority, and now has for most purposes almost completely replaced iron.

Yet an occasional unaccountable failure does occur and reminds us of how much there is yet to learn. Frequently, when the individual cases have been studied closely, it has been found that the steel in question was of normal composition or at least contained no constituent that explained its weakness.

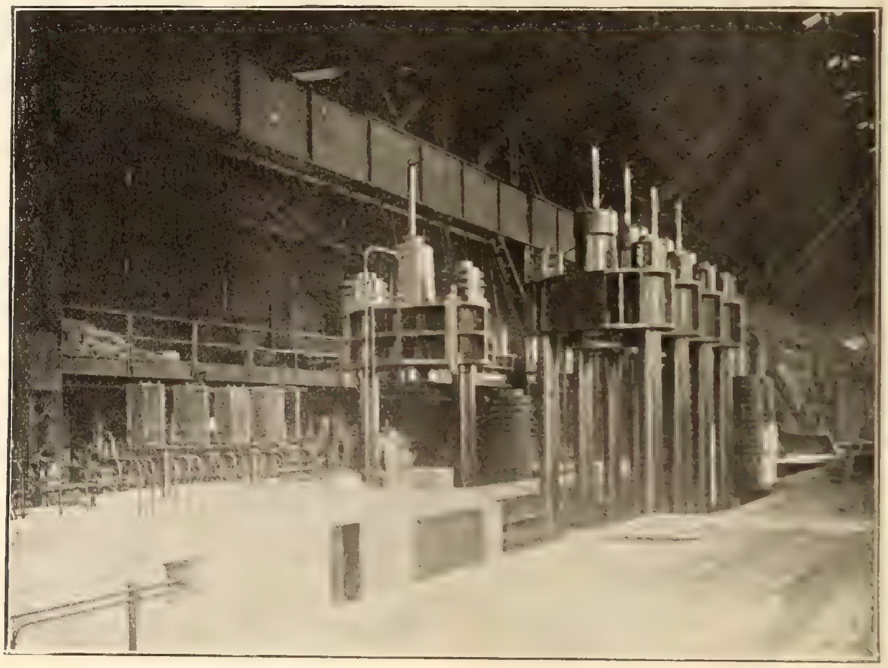
But what do the authorities say on the subject? While there is a lack ofconformity in opinion upon some points of the question still under controversy, yet perhaps most competent and experienced metallurgists would agree in putting the majority of inexplicable results obtained down to variation in molecular structure. If pressed further they would talk of pipes, cracks, segregation, blowholes, occluded gases, internal strains, crystallization, etc.

That such defects exist is common knowledge, and it is a fact that the critical time for the inception and growth of these evils is during the period when the steel passes from a molten liquid into a stable solid.

But, it is asked, what are steel manufacturers doing about it? Most of them are doing nothing, because for ordinary purposes the usual merchant-brands of steel are satisfactory, and any extra cost of treatment is prohibitive.

Those manufacturers, however, who produce the highest grade steels for use where utmost reliability is demanded, as for high-grade forgings, subject the metal to a high pressure while it passes through the dangerous transformation stage; in short, they fluid-compress it.

In order to appreciate the ultimate effect of the process upon steel, it is necessary to consider the various stages in the production. With this in view, the production of marketable steel has been divided into three stages, as follows:—



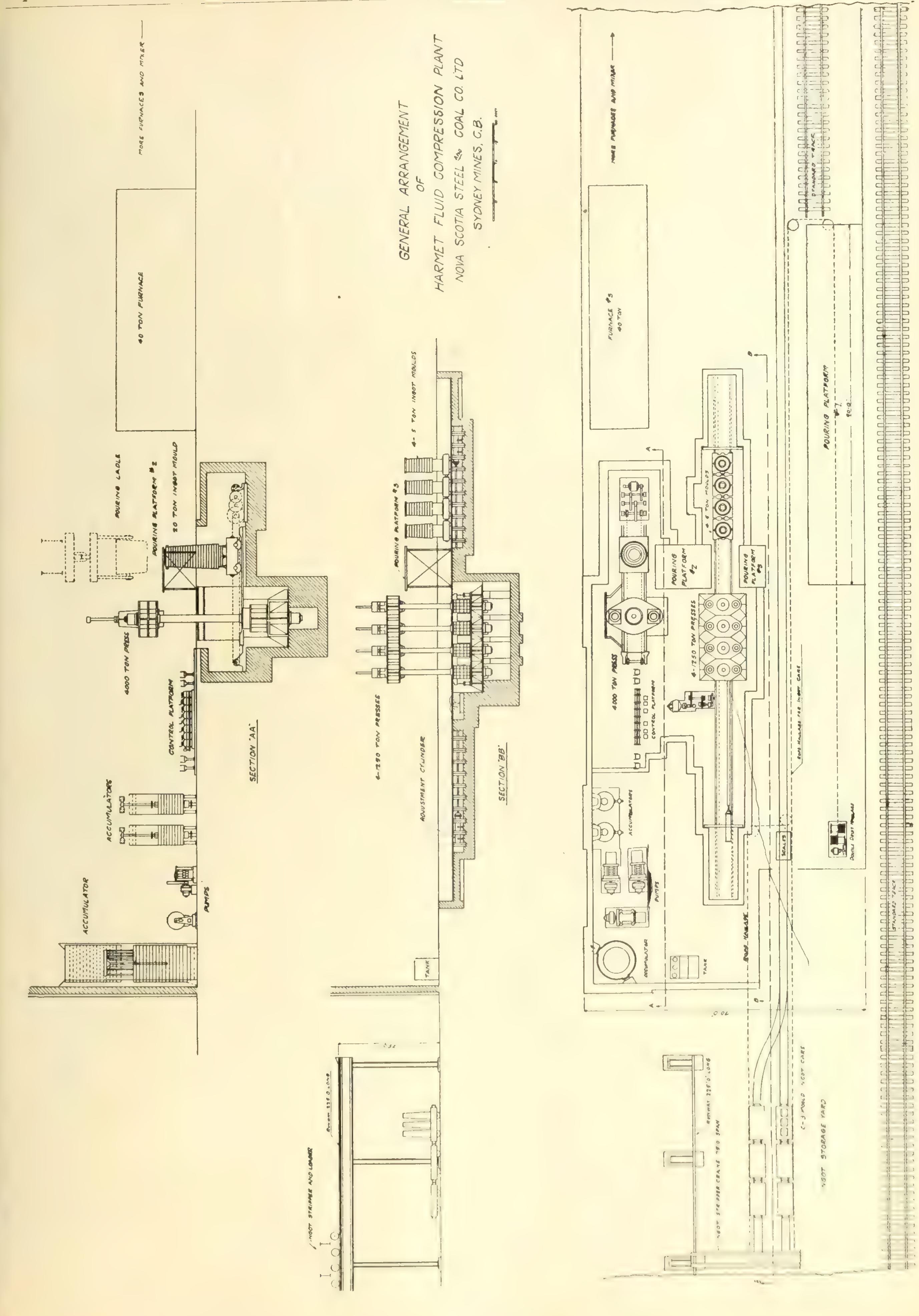
Fluid Compression Plant showing control valves in left foreground

1. The production of liquid metal with the desired chemical composition, without admixture of slag, without gases in solution, oxides, or non-metallic inclusions.

2. The transition from the liquid to the solid state within the ingot-mold, this being a crisis attended with many risks, since the violent contraction is apt to seriously strain and rupture the metal mass, and cause defects which appear almost impossible to completely remedy in a satisfactory manner later on in the manufacturing process.

3. The third stage consists in the conversion of raw salid material into finished products, such as billets, bars or rods, accomplished by reheating, rolling or forging.

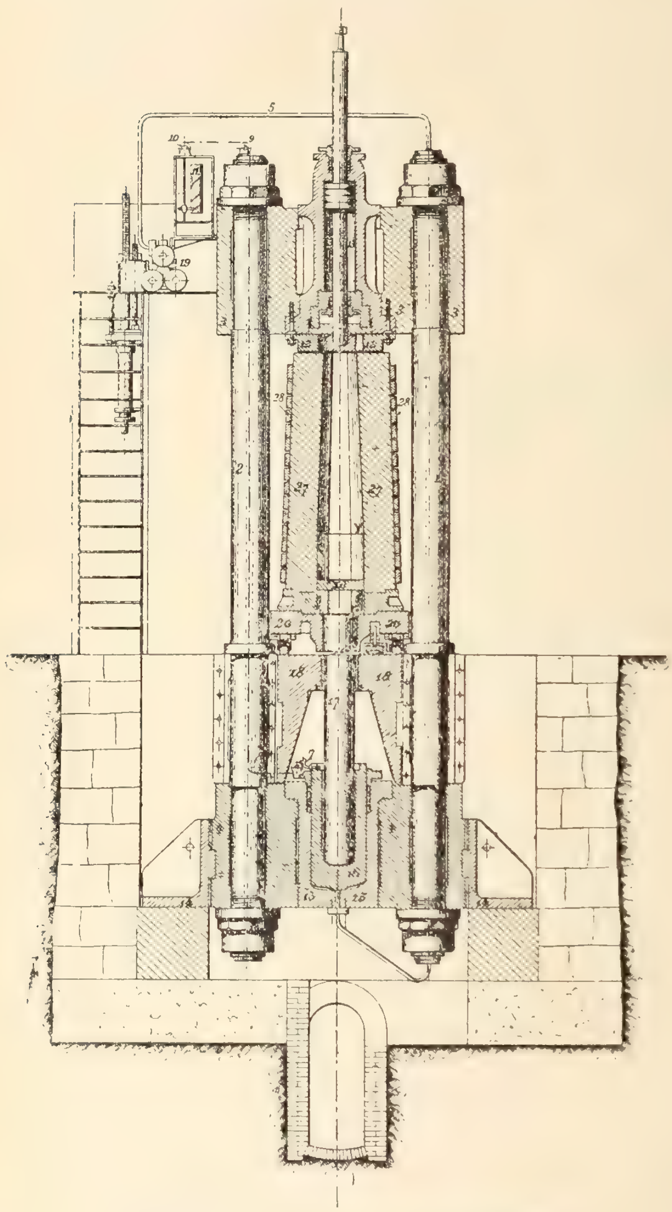
Of these stages the third is the most open to control, and the least delicate; although special care in treat-


GENERAL ARRANGEMENT
OF
HARMET FLUID COMPRESSION PLANT
NOVA SCOTIA STEEL & COAL CO. LTD
SYDNEY MINES, C.B.
MORE FURNACES AND MIXER
40 TON FURNACE
POURING LADLE
POURING PLATFORM #2
20 TON INGOT MOULD
4000 TON PRESS
CONTROL PLATFORM
ACCUMULATORS
ACCUMULATOR
PUMPS
SECTION 'AA'
4-5 TON INGOT MOULDS
POURING PLATFORM #3
4-1250 TON PRESSES
ADJUSTMENT CYLINDER
SECTION 'BB'
TANK
INGOT STRIPPER AND LOADER
FURNACE #3
40 TON
POURING PLATFORM #2
POURING PLATFORM #3
4-1250 TON PRESSES
4000 TON PRESS
CONTROL PLATFORM
ACCUMULATORS
PUMPS
ACCUMULATOR
TANK
POURING PLATFORM
SCALES
STANDARD TRACK
INGOT STORAGE YARD

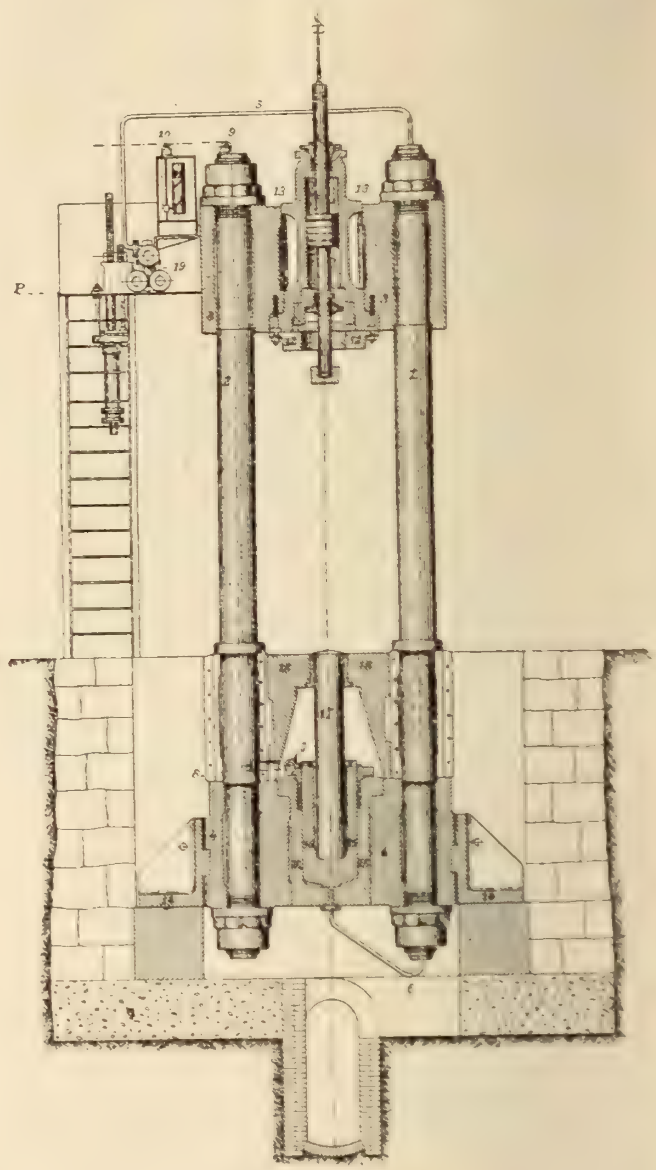
ment and expert knowledge are requisite to attain the best product in each case.

The first stage, that of producing the molten metal, being carried out in a furnace at a high temperature, is difficult to control, while the second stage, which has to do with the physical qualities and molecular structure of the components of the metal, imperceptable to the naked eye, has only come up for solution comparatively recently, and is the most difficult of all.

The defects, almost invariably found to occur in steel



Section through Press—Mould in Position



Mould not in Position

that has been cast in an ingot-mold are as follows:—

The upper portion of the ingot is affected with pipe, and blowholes are present. The whole mass is seamed with cracks, torn by internal stress, and cleft by crystallization; while the composition is rendered irregular by liquidation.

Of these, piping, blowholes and segregation, or liquidation, are most commonly known by users, as they are by the steel manufacturers, who most carefully and constantly watch for these irregularities.

To guard against the effects of their presence the most affected portion is cropped. Where utmost reliability is essential, further efforts are made to minimize their influence by hollow-boring the ingot, etc.

All these irregularities in composition and unhomogeniety in structure are ultimately due to two forces, namely, crystallization and shrinkage. These two forces are always present and acting vigorously. Further, the time in which the trouble develops is limited to that period in which the liquid metal passes through the so-called solution stage into the stable solid state.

Owing to the natural difficulties in the way, such as high temperature, the weight of the mass to be handled, and the tremendous forces required to be controlled, little was done to solve the problem until about 1865, when Whitworth undertook the task.

The solution which suggested itself to him was to submit solidifying steel to great pressure. This would force some, if not all, of the occluded gases to exude, reduce the blowholes to insignificant dimensions, and also would prevent the formation of pipes. Further, by equalizing the pressure thoroughout the mass, a more

homogenous steel, both physically and chemically, would be obtained.

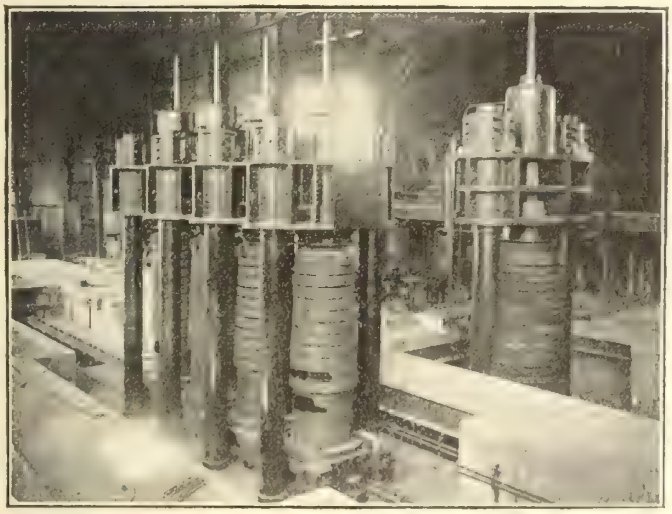
The Whitworth process consisted, in brief, of subjecting the fluid steel, which had been poured into a side-strengthened sylindrical mold designed so as to let

Pumps and Accumulators for Compression Plant

the gas escape through its wall to a pressure of above two tons per square inch, and preferably six tons or more.

It was found when this pressure was applied, enormous volumes of gas were driven through the opening in the mold with a loud roar and the ingot shortened rapidly at first, but later on more slowly; the entire shortening amounted to about 8 to 10 per cent. less than when cooled in the ordinary manner.

The objection to this process is the high initial and operating cost that is necessary, and also its technical deficiency, in that the pressure applied is upon the top of the ingot only. This is its strongest point, and to accomplish compression the maximum amount of energy has to be applied.



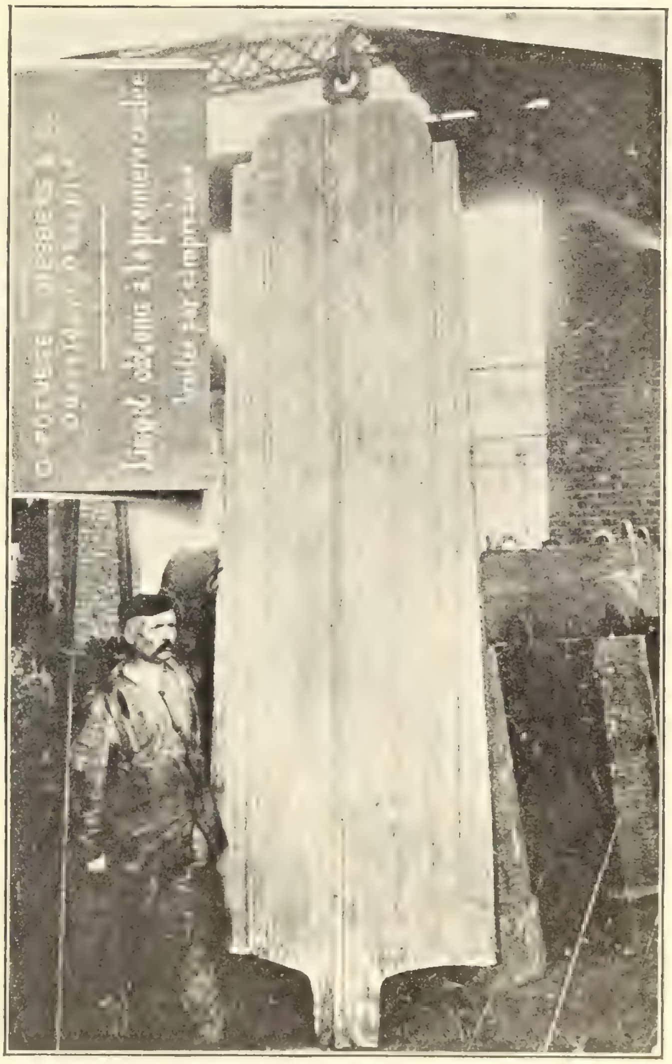
One 4000-ton and four 1250-ton Hydraulic Presses

To create a slight pressure within the soft interior, the most unyielding portion, the early freezing walls must naturally compress in the direction they resist most powerfully.

A further disadvantage of the Whitworth system is that the pressure tends to make ingots open up like the staves of a barrel, thus forcing the rich segregated matter through the interior into the crevices thus formed on the outside.

These imperfactions are serious. The improvements made in the quality of steel, however, are very important, and the subject has been carefully studied and experimented with ever since.

Within the last few years an effective method of fluid-compression, which can be operated at a reasonable cost, has been perfected. This was done by M. Harmet, of Saint-Etienne, France. A full description of his process will be found in both The Journal of the Iron and Steel Institute and Stahl und Eisen.



Harmet Fluid Compression Ingot

M. Harmet calls his process wire-drawing, and states that in it the main object is not so much to remedy the defects of the metal already mentioned, as rather to foresal their development. In order to do this, pressure is applied to all sides of the steel. This is effected by using a slightly cylindrical mold, of greater area at the bottom than at the top, thus obtaining intense compression with a relatively small expenditure of power due to wedge-action.

The mechanism by which this is accomplished is very heavy and quite ingenious. (See accompanying photographs.)

The work expended in compression is constant, for steel of any definite character, and proportionate to

the total contraction of the mass upon which it acts. That is, the compression by wire-drawing acts on the lateral surfaces as well as the ends of the ingots, crushing them inward to diminish the volume; at the same time work is performed proportional to the amount of closing in the material, that is to say, to the contraction for each pound of metal.

It will be seen that the Harmet process possesses all the advantages of the Whitmore press, while the chief objections to fluid-compression as carried out by that method are overcome.

The effect claimed for this treatment is that it:—

1. Prevents formation of shrinkage—cracks in the outside wall of the ingot.

2. Causes early cessation in crystallization of metal as the pressure hastens transition from liquid to solid.

3. Lessens segregation, e.g., reduces tendency of carban and other impurities to accumulate in the upper part of the ingot. The movement of the top of the ingot into the upper and cooler portion of the ingot-mold adds to this tendency.

4. The resulting lateral pressure prevents the formation of any "pipes" or interior cavities, and thus preserves the absolute solidity of the ingot.

5. Produce a fine crystallization without a cleavage plane.

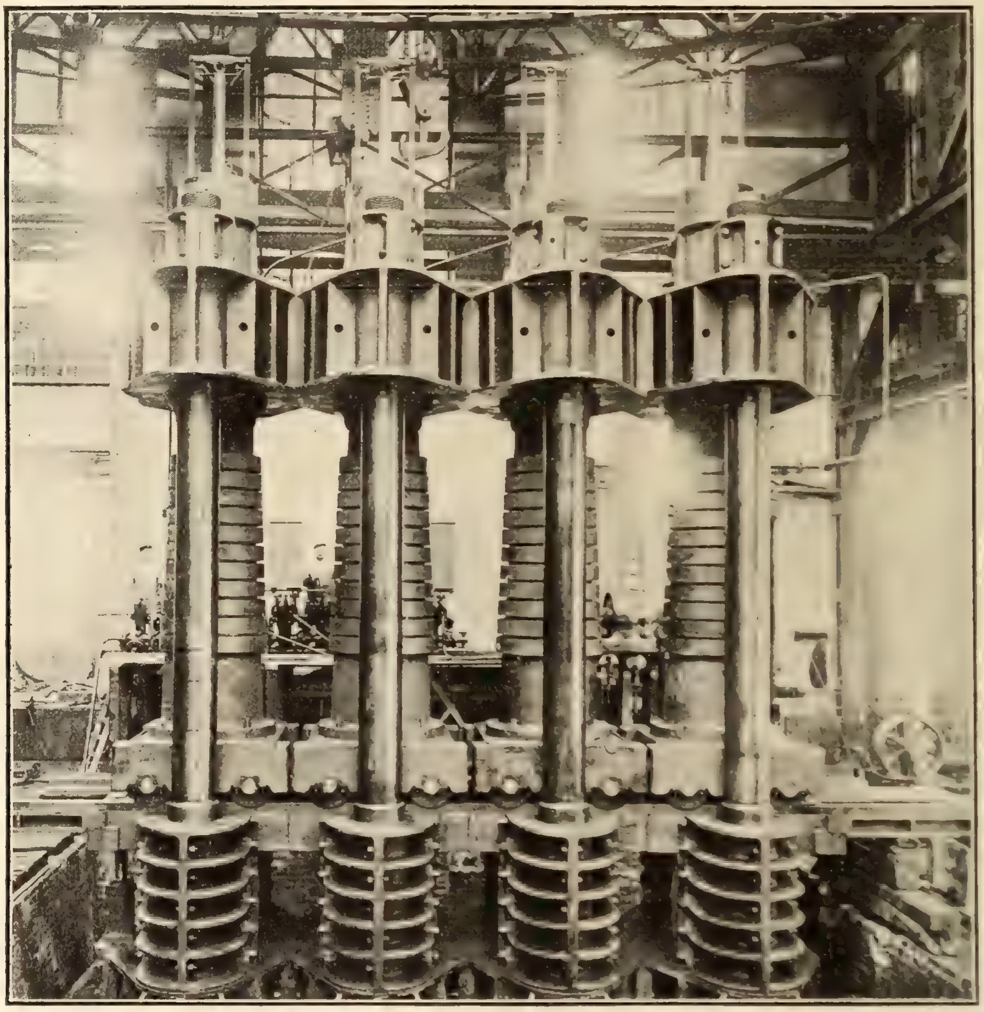
6. Greatly reduces liquidation.

7. Generally improves physical properties, owing to the mechanical effect being similar to forging.

8. Reduces waste of ingot, due to crop ends, since the uniformity in composition and absence of cavities or pipes is maintained throughout the whole of the ingot.

9. Prevents formation of stresses, crack or fissures, due to shrinkage.

That the Harmet method of fluid-compression does effect improvements on the points mentioned has been proven in practice, and is now generally acknowledged.



Group of four 1250-ton Harmet Presses

It is only necessary in concluding this section to give the following opinions upon the value of fluid compressing steel:—

The eminent authority on iron and steel, Professor H. M. Howe, referring to liquid compression, says: "To sum up, in proper hands, the liquid compression of large masses, if powerful enough, does, according to our present evidence, prevent pipes, blowholes and cracks almost completely."

Professor Arnold says that as far as his knowledge goes the only trustworthy and practical way to prevent liquidated regions, pipes and pockets in steel is to cool the ingot under fluid-compression, and to prevent segregation the Harmet process, he says, seems very successful.

Finally, Mr. Bradley Stoughton, the well-known American metallurgist, sums up a recent article on this subject as follows:—"In conclusion, compression during solidification lessens the liability of steel to contain the remnants of pipes, blowholes, segregation and external cracks, and partially prevents the development of a weak structure during crystallization.

"So far as shown by the tests we have been able to find, it also slightly increases the strength of finished steel and increases its toughness under impact besides making the different parts of the ingot more uniform in quality both before and after rolling."

The Nova Scotia Steel and Coal Company, realizing the importance of fluid-compression as a valuable aid in producing reliable and first-class steel products, has purchased the Canadian rights from M. Harmet whereby they secured the sole rights in this country to use his process. This advance they considered advisable in order to keep abreast of modern progress, and particularly that their high reputation as manufacturers of heavy railway and machine forgings should be ustained and advance with the best current practice.

The fluid-compression plant of the Nova Scotia Steel and Coal Company, recently laid down at Sydney Mines, C.B., consists of one group of four Harmet presses, each of 1,250 tons and capacity to handle 3½- and 5-ton ingots; and one of 4,000 tons to handle 18- and 25-ton ingots. The presses proper are equipped with the necessary pumps, accumulators, manipulating valves, etc.

These accessories include three 3-throw motor-driven pumps, one of 200 litres per minute at 50 atmosphere, and two 25 litres capacity at 450 atmosphere.

The presses and accessories are erected in a extension to the existing open-hearth building and situated close to the furnaces, and arranged so that the pouring-ladle containing the metal to be compressed has, as it comes directly from the furnaces, only a short distance to go to the pouring platform. (See accompanying plan.)

The process of compression is quite simple in theory, and all the difficulties to be faced are mechanical ones. The presses are all similar in design.

The press proper consists of two hydraulic cylinders, actuating pistons, having at their ends rams designed to fit loosely the inside of the top and bottom of the ingot mold respectively.

The cylinders are held a certain fixed distance apart to allow the ingot-mold to be introduced between them, when the rams are withdrawn. This is effected by heavy tie-rods, which are fastened to the lugs upon the cylinders.

The ingot molds are cast-iron, tapered and strongly reinforced with steel bands to withstand great pressure, and stand upon heavy movable cast-steel buggies, through the floor of which a short shaft transmits the pressure as received from the lower ram piston to the bottom of the ingot.

The upper ram over it is brought directly in contact with the metal in the top of the ingot, and merely acts as a buffer to the bottom ram which supplies the power for the actual compressing. The upper ram is slightly withdrawn from time to time as the ingot is pushed further into the mold.

The mold buggies are movable and run on an horizontal track which extends sufficiently far on either side of the presses proper to give plenty of standage room. In the case of the group-press there is standage room for a train of four molds quite clear of the presses.

The buggies are hauled along the track by means of an hydraulic operated conveyor until the correct position is attained under the press, where it is securely held by means of similarly actuated stops which come up through the floor.

The pouring platform, upon which the ladle and stopper men stand when pouring the heat, is situated at the side of this track slightly removed from the presses.

As mentioned, the empty mold is placed in its movable buggy and when ready to receive metal is moved to a position immediately next the pouring platform. As soon as the mold is filled with metal it is propelled into position immediately under the press, and the process of compression commenced. Each of the group molds is poured successively and compression commenced on each immediately it is in position under the press.

Once this position is attained a water spray is turned on to cool the top of the ingot and the top ram let fall to come in contact with the metal. The bottom ram is then brought into service and a pressure gradually increasing up to three tons per square inch of ingot bottom area is employed.

The total pressure upon the ingot in the case of 3-ton ingots amounts to 1,250 tons.

The length of time before full pressure is reached depends upon the size of the ingot, and may be taken as fifteen minutes for each ton of metal or, say, 45 minutes for three tons. The total time under press for these conditions is about two hours.

Connected with each of the press rams there is a system of cords connecting with and operating a pencil moving over the surface of a constantly rotated cylindrical drum. The vertical movements of the pencil show the contraction due to longitudinal shrinkage of the ingot, and thus a continuous time-displacement curve is obtained throughout the compression period. The pressure upon the ram cylinders may be read directly from pressure gauges, situated with the above-mentioned diagram, in front of the hydraulic controlling valves upon the press operator's platform.

It has been found that in order to produce steel of the best quality for ingots of a certain size, form and composition, a definite curve must be followed. Once this curve is obtained for any particular condition, it is only necessary to cause the pencil or pointer to follow it by regulating the pressure.

When the compression is finished, the bottom ram is withdrawn and the top ram brought into play, thus stripping the ingot. The mold is then removed in the ordinary way and the ingot taken to the ingot yard.

All the output of the compression plant is sent to the New Glasgow works of the company. The 3-ton ingots are there cogged into billets and then forged into railway car and locomotive axles and light forging or manufactured into special material in which the utmost reliability is desired.

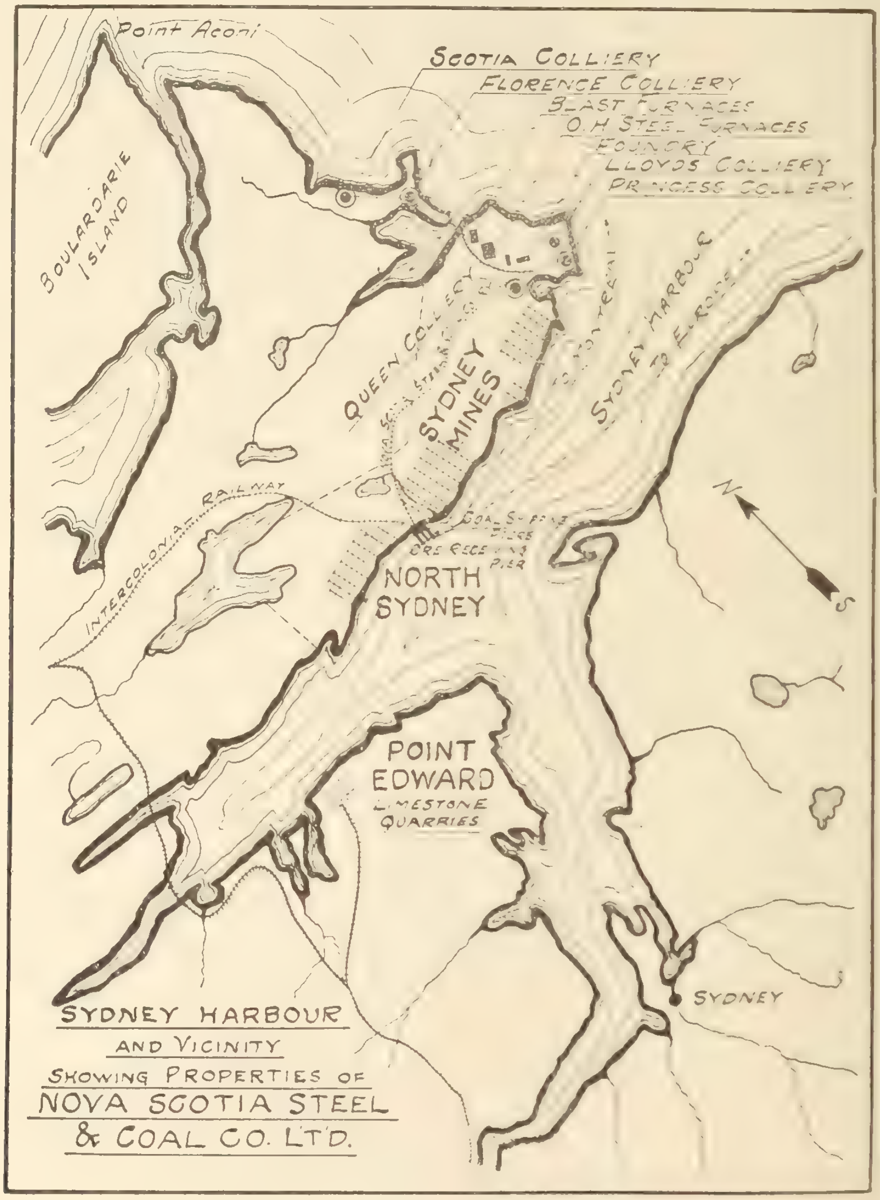
The 5 to 25-ton ingots are used solely for making heavy forgings at Scotia's modern steam hydraulic forging plant at that place.

COAL MINES OF NOVA SCOTIA STEEL AND COAL COMPANY

Written for The Canadian Mining Journal.

When the General Mining Association secured the Duke of York's grant of all the minerals in Nova Scotia and inaugurated systematic coal mining in that province, it selected the Sydney Mines district to commence operations, on account of the excellence of its coal. In the eighty years of that association's history, it operated in nearly every district now worked in the province, but when absorbed by the present owners it held only the areas first mined, having retained these in preference to all others because of the superior quality of the coal. For steam, metallurgical, and general purposes this coal is regarded as equal to any other Nova Scotian product.

The "Scotia" Company hold altogether four different areas, which are estimated to contain over 2,500,000,000 tons of coal. These are the Sydney Mines land, Sydney Mines submarine, Boulardarie land, and the outer submarine areas. The first three areas run continuously from the north side of Sydney Harbour to the south side of the Great Bras D'or Lake, a distance of ten miles, while the outer submarine areas extend from Cape Dauphin to Cape Percy, forming a belt along the entire Cape Breton coal field. Within their areas of seventy-one square miles are supposed to occur every seam which exists in this district, the most important in the province.



The following table shows the different seams in the various areas, and the estimated tonnage in each as reported by the Canadian Geological Survey:

Boulardarie Land Areas.

Bonnar Seam, 6 ft.	2,300,000
Stubbert Seam, 8 ft.	11,500,000
Seam "C," 2 ft. 9 in.	7,100,000
Mill Pond, 4 ft. 6 in.	17,300,000
Black Rock, 3 ft.	20,200,000
Total	58,400,000

Sydney Mines Land Areas.

Lloyd's Cove, 8 ft.	8,400,000
Chapel Point, 4 ft. 2 in.	6,400,000
Sydney Main, 5 ft. 6 in.	31,600,000
Indian Cover, 5 ft. 6 in.	47,500,000
Collins.	44,100,000
Total	138,000,000

Inside Submarine.

Cranberry Head, 3 ft. 3 in.	5,600,000
Lloyd's Cove, 8 ft.	29,100,000
Chapel Point, 4 ft. 2 in.	16,100,000
Sydney Main, 5 ft. 6 in.	24,800,000
Indian Cove, 5 ft. 6 in.	24,800,000
Collins or Stoney, 5 ft.	22,500,000
Total	122,900,000

Outside Submarine—North Sydney Harbour.

Cranberry Head, 3 ft. 3 in.	69,700,000
Lloyd's Cove, 8 ft.	176,600,000
Chapel Point. 4 ft. 2 in.	100,800,000
Sydney Main, 5 ft. 6 in.	147,800,000
Indian Cove, 5 ft. 6 in.	147,800,000
Collins or Stoney, 5 ft.	134,400,000
Total	777,100,000

Lingan Section (Outside Marine).

Seam "A," 3 ft.	37,400,000
Car, 6 ft. 6 in.	81,100,000
Barrasois, 12 ft.	149,700,000
David Head, 8 ft.	100,000,000
Seam "D," 3 ft.	37,400,000
North Head, 4 ft.	50,000,000
Lingan Main, 8 ft.	100,000,000
Mullins, 6 ft.	75,000,000
Total	630,600,000

Glace Bay Section (Outside Marine).

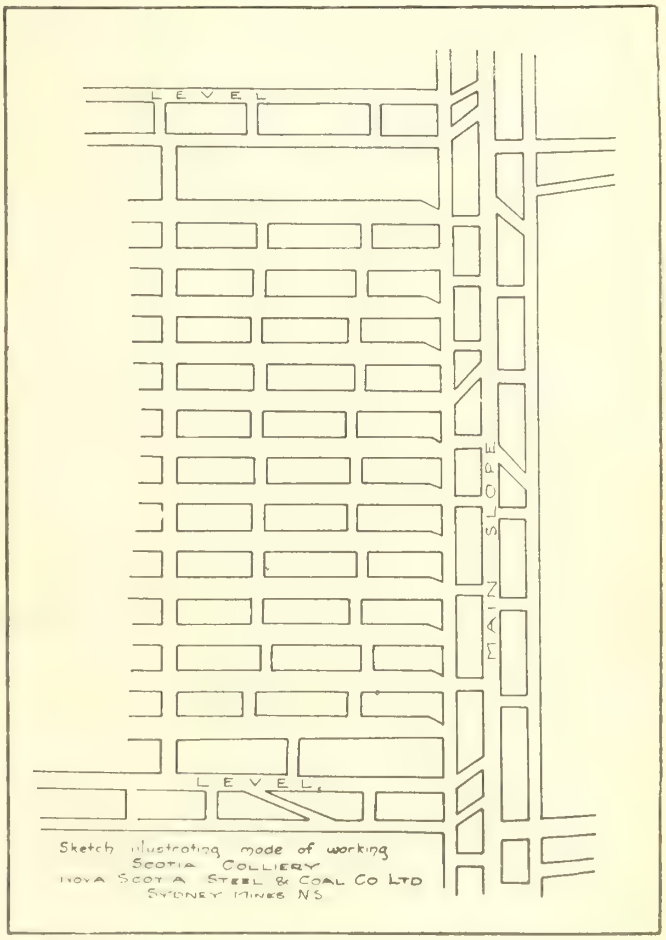
Hub, 9 ft. 5 in.	209,700,000
Harbour, 5 ft. 3 in.	115,900,000
Black Pit, 4 ft. 9 in.	104,700,000
Phalen, 8 ft. 3 in.	190,000,000
Ross, 5 ft. 6 in.	121,300,000
Lorway, 4 ft.	88,300,000
Total	829,900,000

Recapitulation.

Land areas	196,400,000
Inside marine	122,900,000
Outside marine	2,237,600,000
Total.	2,556,900,000

Only a comparatively small portion of these areas has been worked in the ninety years of mining at Sydeny Mines. Operations have been confined almost entirely to the southern part of the Sydney Mines land and submarine areas, collieries having been opened in the central portion of that district only within the last two or three years, while as yet not a pound of coal has been taken from the northern side or from the Boulardarie or the outer submarine fields. So extensive are these areas that a new mine could be sunk on them every year for twenty years.

The history of the General Mining Association is closely bound up with the industrial development of the province. This company was organized in 1825 by Messrs. Rundall, Bridge and Rundall, of London, and secured a lease of all the minerals of the Province from the Duke of York, to whom they had been granted by his brother, George IV. Mr. Richard Brown, an eminent mining engineer and geologist, was sent out to develop the coal fields and in the eighty years of the General Mining Association's existence it had only two managers, Mr. Brown and his son, Mr. R. H. Brown, who succeeded his father in 1864, and continued in the management of the property until its transfer to the

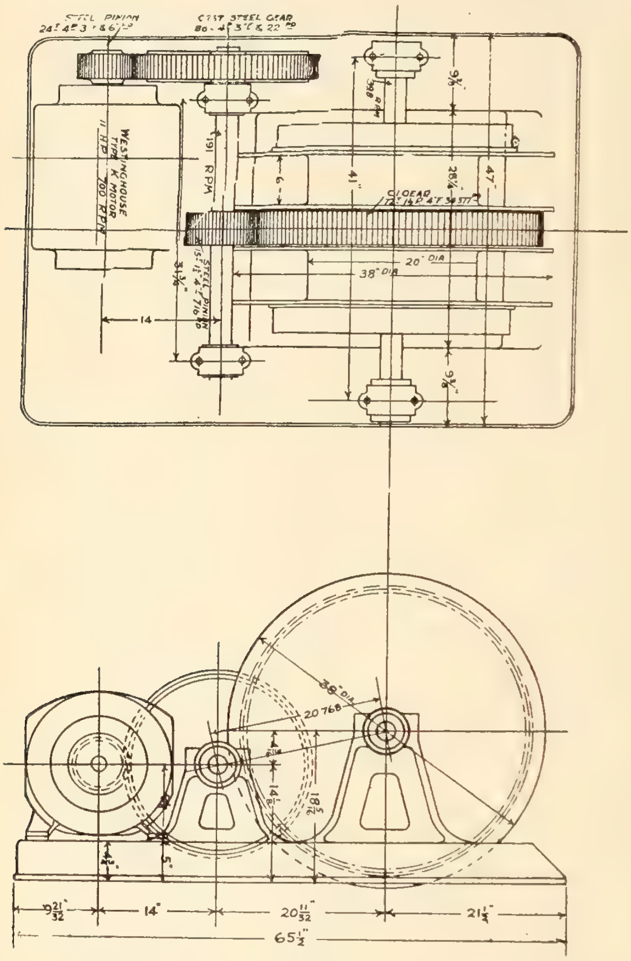


present owners. The first pit was sunk at Sydney Mines about 1830, and this property was gradually developed. Operations were soon started in other parts of the province, which led to agitation against the monopoly enjoyed by this company, and for many years the "Duke of York's Lease" was one of the chief political questions of the province. The dispute was finally settled by the Government of Nova Scotia purchasing His Royal Highnes's interest in the minerals of the province, an arrangement being made with the General Mining Association whereby that company abondaned its holdings outside of Cape Breton, for which it received concessions in the way of rentals and taxation.

Various collieries were opened by the General Mining Association under the new agreement, at different points. The most important of these was the "Queen"

pit, sunk in 1854, but subsequently abandoned and re-opened by the present management as Sydney No. 5 colliery, and the "Princess," or New Winning Pit, work on which was commenced in 1878, and which, as Sydney No. 1, is one of the chief collieries of the province. It took eight years to compete this mine, and its sinking called for considerable skill for those days, as the sea-water leakage was very heavy. This difficulty was overcome by lining the shaft with cast-iron tubing, and so well was the work done that no trouble has been experienced since.

Sydney Mines has been transformed since the General Mining Association went out of existence. When the Nova Scotia Steel and Coal Company took over



10 h.p. Electric Hoist, No. 4 Colliery

the property there was bupt one colliery in operation, with an annual output of 240,000 tons. To-day five well-equipped mines are producing 900,000 tons.

The thickness of the coal seams operated by the various mines runs from 4½ to 6½ ft., the dip being uniformly about eight per cent. The coal is mined by the room and pillar system in all five collieries, but several different systems of mining, pumping, haulage and ventilation exist in different mines to meet varying conditions. In No. 1 and No. 5 mines, the oldest of the collieries, the coal is mined by handpicks. Compressed air coal-cutters are used in No. 2 and No. 3, while electrical machines win the mineral in No. 4. Pumping, ventilation and underground haulage in No. 2 mine are done by compressed air, electricity being used for these purpose at No. 4, and steam generally at the remaining mines. The main haulage engines in all the collieries are operated by steam. No. 1 and No. 5 mines have vertical hoisting shafts, while Nos. 2, 3 and 4 are slopes. The workings of No. 5 and No. 1 merge; any water that enters the latter mine being allowed to run down the slope to the former pit, which is 3,000 feet away, to be handled by the pumping equipment there. The ventilating equipment at No. 5 also supplies air to No. 1.

No. 1 mine is situated near Cranberry Head, the northern boundary of Sydney Harbour, and has been working in the submarine areas for many years. Its workings are now over two miles from shore, 1,000 ft. below the ocean bed, and cover two thousand acres. There are separate haulage systems in the pit, an endless service in the south side, with over 25,000 feet of rope in service, and a plane haulage 7,200 feet long on the north side. About seven hundred men are employed underground, and the daily output averages one thousand tons. The surface plant here is the most extensive of any of the collieries, being used as a central plant for much of the operations of No. 2 and No. 5 mines. There are six Babcock and Wilcox boilers, three of which burn the waste gases from a battery of thirty Bauer coke ovens, the remainder being fired by a mixture of slack coal and coke breeze. The coal is hoisted with a direct-connected 36-in. by 60-in. engine with 20-ft. drum. The hoisting cages are in balance, each carrying two tubs of coal; on reaching the deckhead the tubs are run from the cages to a quick-reading platform scale, then dumped by a tipple on to a bar screen, which separates the coal into two sizes and delivers the screened coal to a combined picking belt and elevator, where it is picked and elevated to a sufficient height to load into 15-ton hoppers. The men are hoisted by a separate man-engine, equipped with both regular and safety brakes. The ventilating equipment is in duplicate, consisting of a Capell fan and a Walker Guibal fan, each supplying 120,000 cubic fee of air per minute. These are located at No. 5 mine, and ventilate both collieries. Compressed air is furnished at 80-lb. pressure by a Walker compressor, which supplies 4,000 cubic feet per minute. The water from the lower part of the mine is pumped to a pump near the pit bottom by a Duplex Northey and two Cameron pumps, and is handled from that point to the surface by a 600-gallon Janesville pump.

No. 2 colliery is equipped to produce 500 tons per day. The mining is done with compressed air machines, and the same power operates the ventilating equipment. The coal is hauled from the levels and headways to the haulage slopes by small engines. The compressed air is supplied from the No. 1 plant, and the haulage engine is also operated at the same point.

No. 3 mine is some two miles north of No. 1. Six hundred men are here employed, and the daily output averages one thousand tons. There are three parallel deeps which are now down 8,800 feet. One is used for haulage, the second for a travelling road, and the third for ventilation. Six 240 h.p. Sterling boilers supply steam for the various engines at this mine, and are equipped with forced draught fans to facilitate the burning of the wash-plant waste, black band and coke breeze used as fuel. Double-end, single-friction hoists haul the coal out of the levels and headways and an endless rope haulage delivers the coal tubs on the bank-head floor. The tipples, screens and picking belts are in duplicate, each set being capable of handling 75 tons per hour. The mine pumps are driven by compressed air.

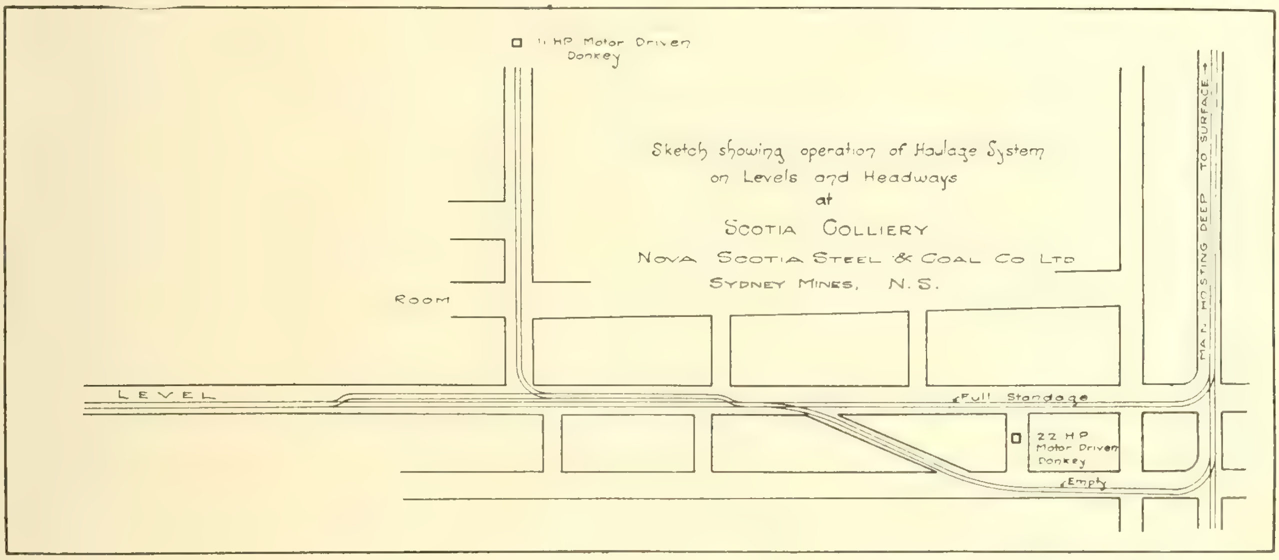
The remaining colliery, No. 4, was the last to be opened, and is one of the most interesting coal mines in the province. This is not because of its size or the magnitude of difficulties that were overcome, but because of its being electrically operated underground.

It is the only colliery in Canada in which mechanical appliances are utilized to the utmost and yet which does not contain a steam or air-pipe. All cutting of coal, haulage and pumping is done electrically.

Beyond this feature the equipment of this colliery is marked by its simplicity, and we commend to those interested in such matters the following account of the plant and operating methods, by which 1,000 tons have been mined per day, with a minimum capital investment and low working cost.

No. 4 Colliery

Situation.—No. 4 Colliery, or, as it is now known, the "Scotia," is situated about three miles to the north of No. 1, or "Princess" Colliery, and was opened in 1906 to work that portion of the coal areas held by the company lying between the Little Pond and the Little Bras D'or Gut.



The seam worked is tht famous "Old Sydney Main," and the coal is won by means of a slope following the seam from the outcrop and extending downwards on the full dip in an easterly direction.

Three slopes are driven in the coal, the main or haulage slope being twelve feet wide, and two companion slopes ten feet wide, which are used for travelling and ventilating purposes.

Surface Plant.—The colliery is operated on the most approved mining methods, and is fully equipped with the most modern and up-to-date appliances for coal-getting, hauling, pumping, ventilating, screening and lighting, signaling and telephoning.

Boilers.—The boiler plant consists of five Matheson return-tubular boilers, each of 175 h.p., and one Lancashire boiler, 28 ft. x 7 ft., all hand-fired, and carrying 80-lb. pressure, with natural draft.

Generators.—The electrical equipment consists of two Crocker-Wheeler generators, each of 100-k.w., 275 r.p.m., 275 volts, direct-driven by Robb-Armstrong engines, cylinders 15 in. x 16 in.

An ample switchboard contains the necessary meters for recording output and consumption, cut-outs, switches, etc., for controlling and distributing the current to the many points where it is used.

Main Haulage Engine.—The main haulage engine is self-contained, and consists of a pair of 16 in. x 24 in. cylinder, geared to a shaft carrying two drums each six feet in diameter and thirty inches wide. The spur-wheel is eight feet in diameter and the drums each carry 5,000 feet of 7-8 steel wire rope, which hauls the coal from the various levels in the mine to the surface. An output of 135 tons an hour can be easily handled.

Fan.—The mine-ventilating fan is of the type known as the "Sirocco," 54 inches diameter and 60 inches wide, running at a speed of 300 r.p.m., and circulating 48,000 cubic feet of air a minute, with 1 6-10 inch water gauge, and capable of producing 150,000 cubic feet a minute with five inches W. G.

The fan is belt-driven by a Robb Automatic engine 12 in. x 14 in., 150 r.p.m., the belt pulleys being in ratio of 2 to 1.

Screening.—The screening plant consist sof a Browne Machine Company tipple, which, revolving on its longitudial axis, discharges the coal out of the pit tubs on to an ordinary fixed straight bar screen, over which it passes on to a Matheson picking table, 5 feet wide, travelling at a speed of 50 feet a minute, allowing ample time to pick out any stone and impurities that may have been filled among the coal.

The slack coal passing through the bars of the screen falls into a hopper across the bottom of which a belt runs which carries away the slack and discharges it into standard railway cars. The front of the picking table is movable, and can be raised and lowered as the loading of the car proceeds, so as to minimize breakage in loading.

Workshop.—Ample and commodious workshops are conveniently placed and well equipped with forges, lathes, drills and tools of all kinds, suitable for effecting general repairs at the colliery, heavy undertakings being done at the general machine shop of the company.

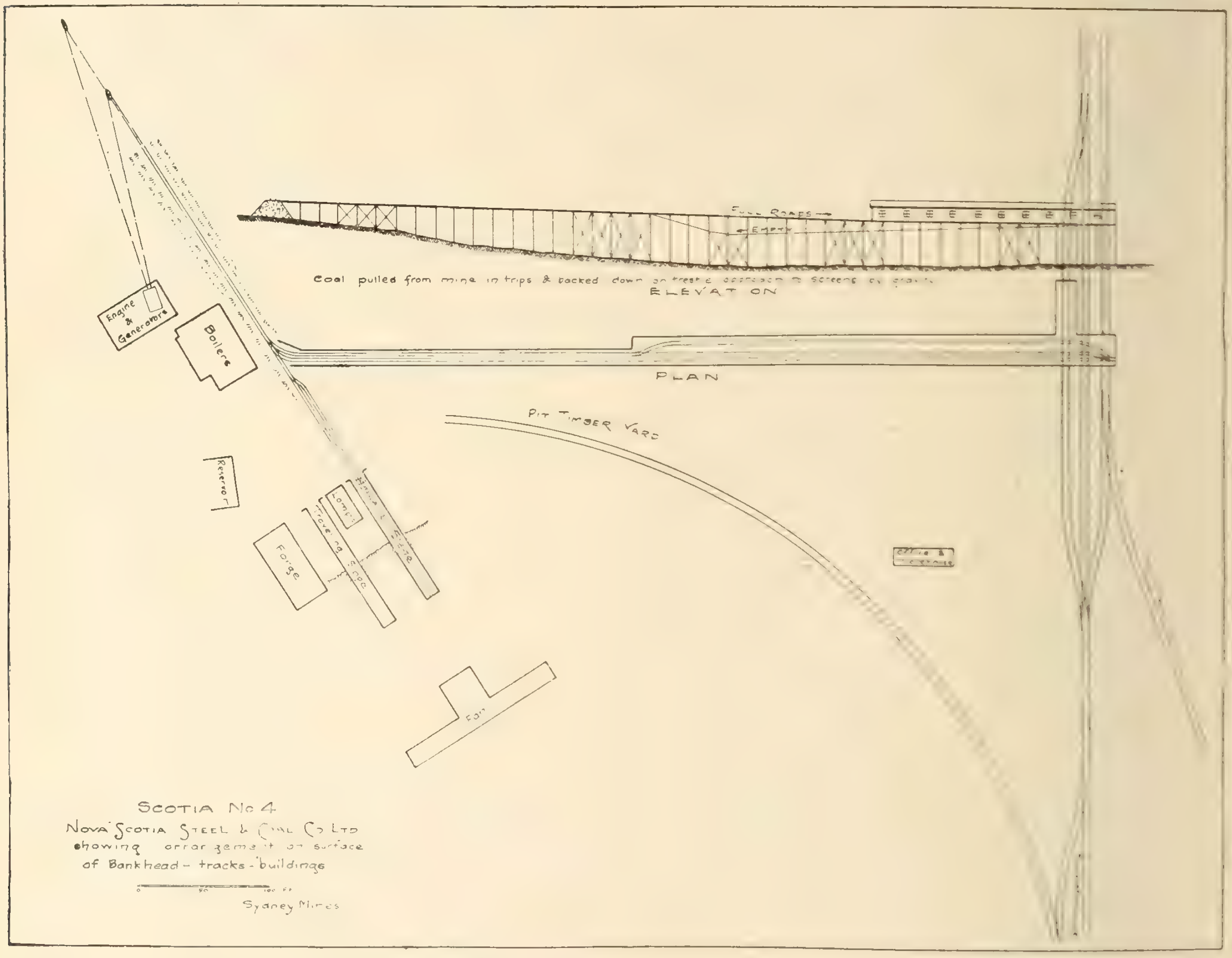
Warehouse.—The warehouse contains a large amount of material, such as is used in connection with the colliery, while any unusual demand can be met by calling on the general warehouse centrally located to the other collieries and works, a few miles distant.

Lamphouse.—Safety lamps being in use exclusively by the workmen employed underground, a suitable

and commodious lamphouse is placed close to the entrance to the mine, where all lamps are cared for, cleaned and repaired. There are 375 lamps in use.

Steam is used only to operate the main haulage in bringing the coal from the various levels underground to the surface, to run the generators and the fan; all other operations, both under and overground, being carried on by electric power.

Mode of Working.—The method of working, which is shown by the accompanying sketch, is what is known as the bord and pillar, and in developing the mine, three slopes are driven down to the dip, and at intervals of 600 feet, pairs of levels are broken off at right angles. As these levels proceed, headways are driven up to the rise, at intervals of 300 feet, having a course parallel to that of the main deeps. From these headways, rooms are broken off, and driven parallel to the levels. The width of the levels and headways is 14 feet, the rooms being 20 feet, while in two sections the rooms are worked to a width of 40 feet, with two tracks.



Coal-cutting machinery is applied to the fullest possible extent in mining the coal, two types of machine being in use. The equipment consists of four "Sullivan" longwall chain machines, and 24 pneumelectric machines of the puncher type. The chain machines have given great satisfaction, and can easily cut an average of four rooms a shift, while on a test, seven rooms have been cut.

The puncher machines cut an average of two rooms a shift, the depth of undercut being from 5 to 6 feet.

Timbering.—In timbering the main deeps and landings, booms 16 ft. x 7 in. diameter at small end are used. The method employed in putting them up is described as "stay" and "sancker." It consists of a hole cut in one wall, into which the thin end of the boom is placed, and a recess cut into the opposite wall, which affords a rest for a short prop, which is driven hard home to tighten the boom.

On the levels and headways and at the faces, 8-foot or 10-foot booms are used, commonly put up with two props, and in the ordinary roof in the workings, props 5 inches diameter and caps 2 feet long are used.

Track.—The main deep and landings are laid throughout with 28-lb. rails, with a track gauge of 30 inches. The main deep is double-tracked from the surface down to the fourth level. All levels and headways and all other tracks in the exterior of the mine are laid with 18-lb rails.

Haulage.—The pit tubs or boxes in use in the mine carry an average weight of about one ton of coal, and with the exception of the short haul between the working places and the headways, which never exceeds 300 feet, the hauling of the whole output is effected by mechanical means.

At the entrance to each level, a small electrically-driven donkey engine is placed, which operates an auxiliary endless haulage on a single track, which brings the coal from the foot of the headways to the standage where the main haulage trips are made up.

Near the top of each headway, a smaller electrically-driven engine is placed, which, by means of a plain drum and length of ½-inch rope, hauls the empty boxes from the level up to the room ends and lowers the full boxes down by gravity to the same point.

At the foot of each headway, on the level, sufficient standage is provided on the high side to accommodate 10 or 12 boxes.

The tubs are raised and lowered singly on headways, while between the headways and the main deep standage the coal is conveyed by the endless rope in trips of 8 to 10 boxes.

The question might arise as to the possibility of working these sections by the back-balance method, but it has been demonstrated that the pitch of our seam, five degrees, is not sufficient to make it a success. The necessity of a balance of comparatively enormous weight and consequent size with its accessories making it a formidable and expensive method in comparison with the present system, where the only difficulty is the removal and setting up of the engine upon the completion of a section. It can be readily seen from the accompanying sketch of this 14h.p. machine, which weighs only 3,200 lbs. and is of very compact design, that its loading upon a tram and removal to and installation in some other location is of little or no account.

In following the coal from the face where it is filled into the boxes by the loaders, who work in pairs, the full box is "pushed" by the loaders out to the headway, and delivered to the chain-runner, who, in return, delivers an empty box to the loaders. While the loaders are pushing the empty box to the face, the full box is being lowered to the standage at the foot of the headway and another empty box picked up and hoisted to another room end, the process being repeated as long as coal is available at the faces.

When the trip at the foot of the headway has been made up, the level trip-runner moves it out over the endless rope on the track and attaches it to the rope by means of the ordinary screw-grab, and follows his trip out and delivers it on the full road of the standage for the main haulage. He then picks up another empty trip on the empty road of the standage, attaching the same grip used on the full trip outward to the ingoing portion of the endless rope and goes in bye for another trip.

The standage for the main haulage consists of two separate roads, the two levels being used for that purpose. The low level is used for the empty trip, and the upper level for the full trips. The lower level is driven and graded to facilitate the running of the empty trips, while the upper level is also graded to allow the full tubs to run out close to the deep, and facilitate hooking on to the rope.

There are seven landings or levels in operation, all of which are connected by telephone with the surface, and as each landing tender makes up his trip of 15 to 18 boxes, he at once calls the boss at the upper landing, who directs and controls the haulage, and gives each landing their turn.

Following the main trips from the landing to the surface, the two tracks in the upper portion of the hoisting slope converge at a point a short distance above the mouth of the slope and here the full trip is brought to a stop and gently allowed to back down over a trestle leading to the screening plant.

On reaching a given point the trip is stopped, the rope detached and hooked on to the empty trip standing in readiness, and is hoisted back again to the same point, and lowered into the slope, another full trip being hoisted at the same time.

As has already been stated, an output of 135 tons an hour can be easily handled.

The full trip having been left standing as aforesaid, the tubs are uncoupled and passed singly on to the scales, where they are weighed and passed on to the tipple, where they are emptied on the screen, the coal passing down on to the picking table, as has already been described.

The accompanying sketches show the arrangements for receiving and despatching the trips on the bank-head at surface, also main deep landings, and auxiliary haulage landings on levels and headway turnouts.

There is no limit to the number of headways that can be operated on one level by means of the endless rope single-track system, but in practice it has never been found necessary to have more than three headways in operation at any one time, for by the time a level has been extended far enough to permit a fourth headway being driven, the first headway opened out would be worked out.

The small haulage engines in use underground consist of a pair of drums 20 inches diameter by 6 inches face, driven by a Westinghouse, type K motor of 11 h.p., at 700 r.p.m. through double reduction gearing. Motor pinion having 24 teeth, 4 pitch and 3-inch face. Intermediate pinion 15 teeth, 1½-inch pitch, 4-inch face; drum gear, 72 teeth, 1½-inch pitch and 4-inch face.

These engines are in some cases, as when operating the levels, equipped with two motors, thus bringing them up to 22 h.p. capacity.

Some have only one drum fitted, while others have a small bull-wheel fitted on one drum, and can thus operate both an endless haulage rope and a plain haulage rope at the same time.

Pumping.—All the water met with in the mine is pumped to the surface by electrically-driven pumps. In the sinking of the main deeps, considerable quantities of water had to be dealt with, due to the upper portion of the mine underlying a bog.

In the initial stages of development, with a minimum quantity of water to handle, against an ever-increasing head of water, small pumps were used, which, however, required frequent shiftings as the deeps receded from the surface.

As the work progressed and levels were opened out, pumps had to be multiplied and temporary lodgments made to overtake the ever-increasing burden, until a suitable point was reached at which some permanent provision could be made for dealing with the water.

To add to the trouble of unwatering the mine, numerous "dishes" or "lags" were encountered as the mine was opened out, into which the water always found its way, and necessitated the placing of numerous small pumps at as many different points all over the mine.

A large permanent lodgment has been made ot the No. 6 south levels, which in a short time will be greatly

enlarged, and be sufficient to contain several months' water, and at this point a borehole 8 inches in diameter has been put down from the surface through which the water is pumped, thus doing away with a long line of 3,000 feet of piping to the mouth of the slope. The borehole is 225 feet in depth.

All the water made in the mine above this point, which includes most of the wet ground, finds its way to and is diverted into this lodgment, while all that makes below that point is pumped up and discharged into the standage and pumped to the surface.

All the other pumps in use draining water out of the aforementioned "lags" discharge their water at suitable points where it flows down hill to the lodgment.

The small service pumps, three of which are in use, are all Duplex, water ends 3¼ in. diameter by 6 in. stroke, driven through a hardened steel worm, working into a bronze gear. The worm is one-inch pitch, three-inch lead triple right-hand thread 4.08 in. outside diameter, the wheel having 42 teeth, 1 inch pitch, 14¼ in. diameter.

The pump is driven by a 5 h.p. Electric Dynamic Company interpole motor, type 3S., running at 1,000 r.p.m By means of worm and worm-gear there is simply a single reduction in this speed.

At No. 3 level, is installed one 5-stage turbine pump, made by Gwynne, Limited, London, England, having a capacity of 250 gals. a minute, against a pressure of 125 lbs. per sq. in. at 1,400 r.p.m., driven by a British Westinghouse 45 h.p., 240 volt, direct-current motor.

At No. 5 level is installed a 2½-in., 4 stage Worthington pump, having a capacity of 100 gallons a minute, against a pressure of 100 lbs. per sq. in., direct-connected to 20 h.p. type M-S-3 Lundell, 240-volt, direct-current motor, running at 1,200 r.p.m.

At No. 6 level, where the permanent pumping station has been located, and large lodgment prepared, a temporary pump has been installed, while the permanent work is being completed.

This pump is an 8-in. x 10-in. Triplex, made by the Canada Foundry Company, having capacity of 125 gallons a minute, against a head of 295 feet, driven by a 50 h.p., 800 r.p.m., 240-volt Canada General Electric motor.

The permanent pump now being installed is as follows:—

One 4-stage, Rees Raturbo pump having a capacity of 500 gals. a minute, against a head of 295 ft. when running at 1,400 r.p.m. This pump is coupled to a 70 h.p., 240-volt direct-current motor, made by the same company.

There are also in operation two 4-in. x 6-in. brass fitted triplex horizontal single-acting mine pumps, driven by 5 h.p., 240-volt, direct-current, Allis-Chalmers-Bullock motor, and in the main and back deep sinkings, two Dean Triplex pumps are used.

Lighting.—Electrical energy being distributed so generally throughout the mine, a most liberal application of the same has been directed toward the lighting of the mine, and at all points where coal is being assembled, the operations are greatly facilitated by the excellent light provided.

On the main deep, at all the main landings, on both full and empty roads, along the levels at the foot of the headways, and at all standages, electric lights are installed, which relieve the gloom and should play an important part in reducing to a minimum accident to life and limb, where so many boys and men are emplayed among swiftly moving tubs and trips.

As has already been stated, safety lamps are in exclusive use in the mine, no open lights now being permitted underground.

Signals.—In connection with the main haulage, and

The type of lamp in general use is the "Marsaut", which has been found to be reliable and give fairly good light.

on the levels where the auxiliary haulages are in operation, electric signals are in general use, while a complete telephone system connects all the main landings and the surface together, and by these means the whole system of haulage is under complete control.

General.—The general surface arrangement is such that there is no crowding, and ample room is provided for extension in any direction, while the yard affords ample room for the storage of timber and all bulky materials, and ample scope is available for disposing of waste material of all kinds from the mine and the screening plant.

The railway accommodation is of the most perfect kind, the sidings being long and providing good standage for a largeoutput.

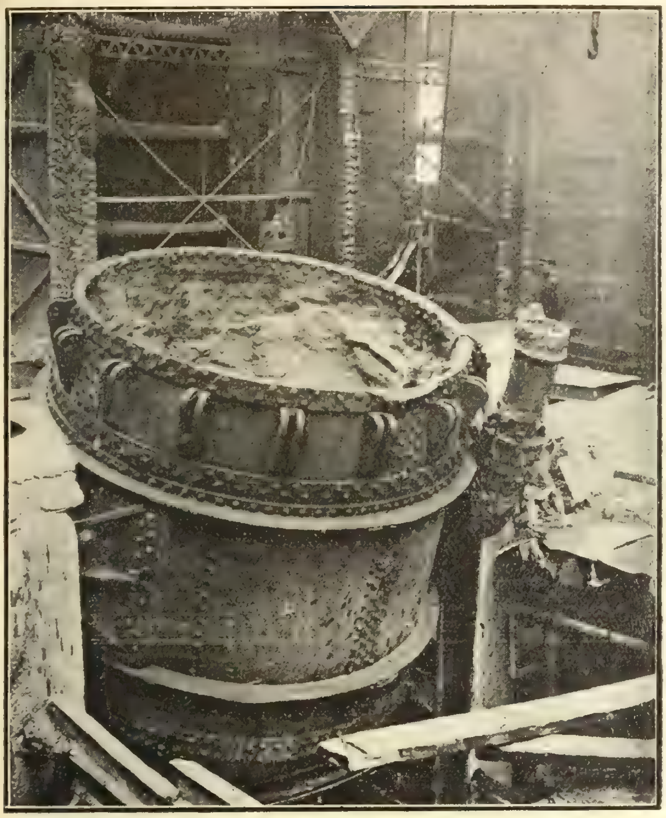
The tracks are well-laid and well-graded, and no trouble is experienced in moving single cars or whole trains, such operations being conducted with a minimum of cost.

The whole of the plant is of a substantial and serviceable character, having nothing superfluous or ornamental about it, but designed and laid out to meet the requirements of the colliery in a combination of efficiency and economy.

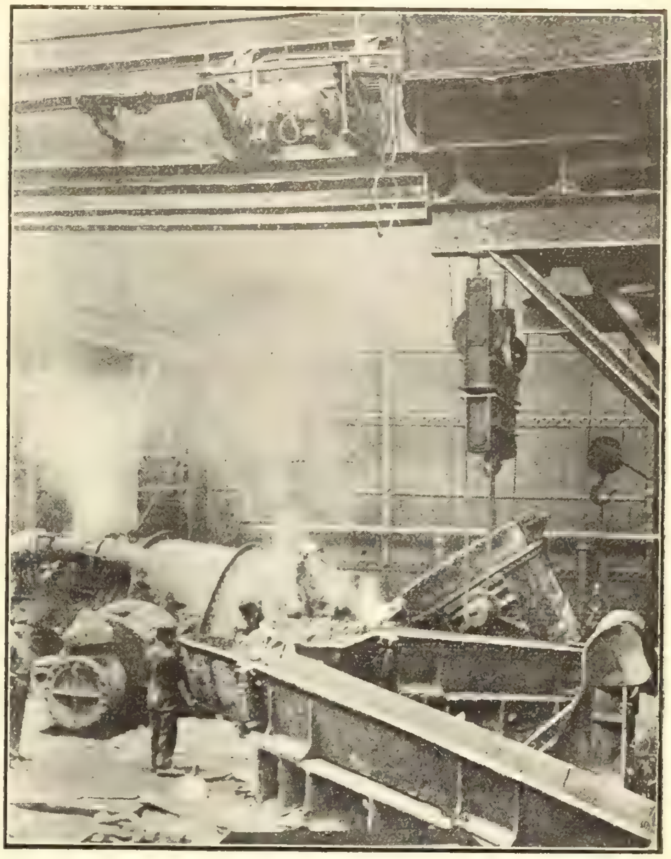
THE DUPLEX PROCESS AT SYDNEY, N.S.

By A. P. Scott, Superintendent Steel Dept., Dominion Iron and Steel Co., Ltd., Sydney, N.S.

The gradual exhaustion of the world's supply of low phosphorus iron ores, and the necessity of depending for steel upon an almost unlimited supply of ores whose phosphorus content is above the Bessemer limit, have been primarily responsible for the development in the last quarter century of the Basic Open Hearth Process, by which by far the greater part of the world's steel tonnage is now produced. This process—beautiful in its simplicity, and in its perfect adaptability to almost any metallurgical problem within its range, has, nevertheless, especially as compared with the extremely rapid Bessemer Process, the disadvantage of slowness: the basic open hearth furnace can make good steel from almost anything in the way of stock, but it takes time, a fifty-ton heat requiring from eight to fourteen hours, depending upon the character of the raw materi-



Converter Turned Up—With Bottom Off For Relining.

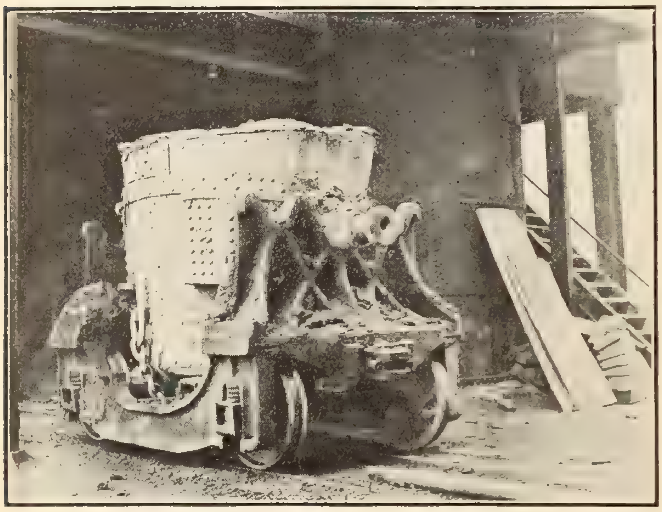


Charging Converter.

Silicon Flame—Regular Blow.

Blowing in a New Bottom.

als, whereas, by the Bessemer Process, ten tons of fluid pig can be converted in as many minutes. It is also true that the open hearth yields more steel per ton of pig iron used than does the Bessemer, because the ore employed in the former contributes a large part of its



Hot Metal Car.

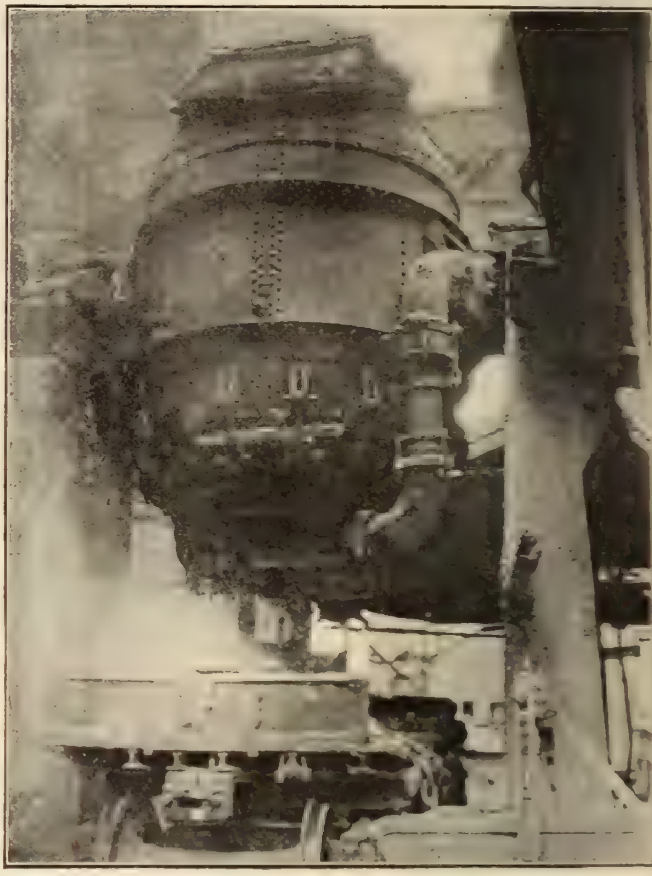
metallic content to the bath, and avoids certain mechanical losses that are almost inevitable in a pneumatic process. It is only natural, however, that the ironmaster, forgetting the merits of the straight basic

Carbon Flame—Regular Blow.

open hearth process, should have chafed at its one defect and attempted every sort of remedy. The majority of such attempts have, of themselves, been failures; others, of which we may mention the Hoesch, Bertrand-Thiel, Talbot and Duplex Processes have met with some measure of success.

General Considerations.

The Duplex process, which has been developed almost exclusively on this side of the Atlantic and



15-Ton Basic Bessemer Converter.

within the last few years, is the result of an endeavour to combine the rapidity of the Bessemer Process with the elasticity of the Open Hearth Process and the ex-

Pouring Blown Metal Into Hot Metal Car.

cellence of the Open Hearth product. This is done by desiliconizing and more or less decarburizing pig iron in the acid Bessemer converter, and thereafter transfer-

ring the blown metal to a basic open hearth furnace, where phosphorus is removed and the refining completed, the combined operations from start to finish, occupying an hour or two, as against the period already

After Blow—Regular Blow.

given as necessary for an open hearth heat. Such a Duplex Process is in successful operation at the Ensley plant of the U. S. Steel Corporation; at Sparrow Point, Maryland; at Steelton; at the Saucon plant of the Bethlehem Steel Corporation, and elsewhere. At cer-

Charging Side—Basic Open Hearth

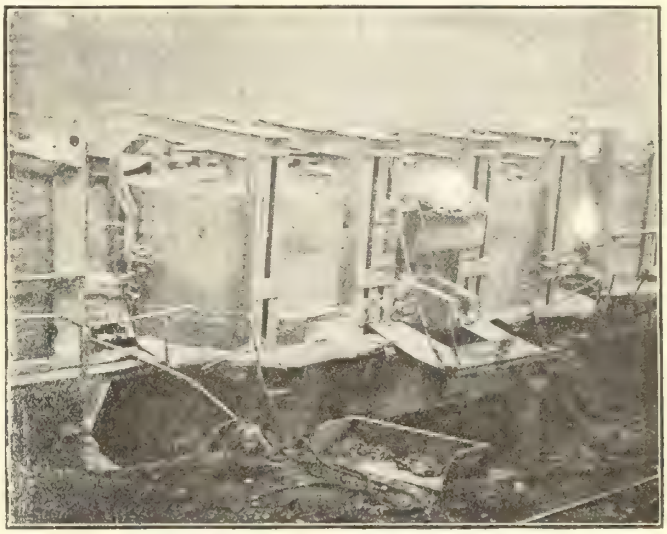
tain plants duplexing is resorted to only at such times as orders and prices for finished material warrant increased ingot production, under some conditions, undeniably increased cost. Again, rather than build additional furnaces, it may be considered desirable to boost open hearth tonnage by duplexing with existing Bessemer plant that would otherwise lie idle. Aside from such special cases, the economy of duplexing as against open hearth practice is essentially a function of pig iron cost, of the scrap market, and, to a lesser extent of the price of fuel and open hearth ore.

Dominion Practice.

The blast furnaces of the Dominion Steel Corporation, with an all-Wabana burden, produce basic iron of the following typical analysis:—

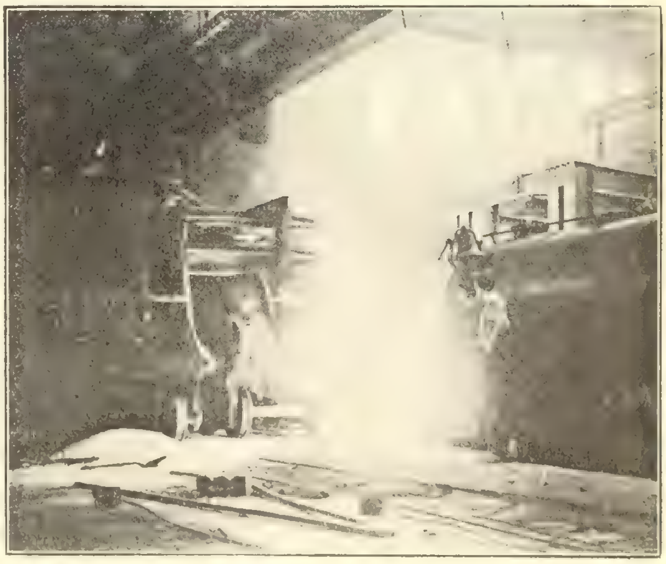
Total carbon	4.25
Silicon	1.00
Sulphur	.05
Phosphorus	1.50
Manganese	.20

practically the entire make, at the present moment, being converted to ingots. The steel-making department



Tapping Side—50-Ton Basic Open Hearth.

comprises one 200-ton metal mixer, two 15-ton Bessemer converters and ten 50-ton basic open hearth furnaces of the Campbell tilting type. Furnaces No. 2 to No. 10, inclusive, are operated according to the straight open hearth process. Furnace No. 1 is operated, in conjunction with the Bessemer plant, in the duplex process; but whereas the process in use at Ensley, etc., may be

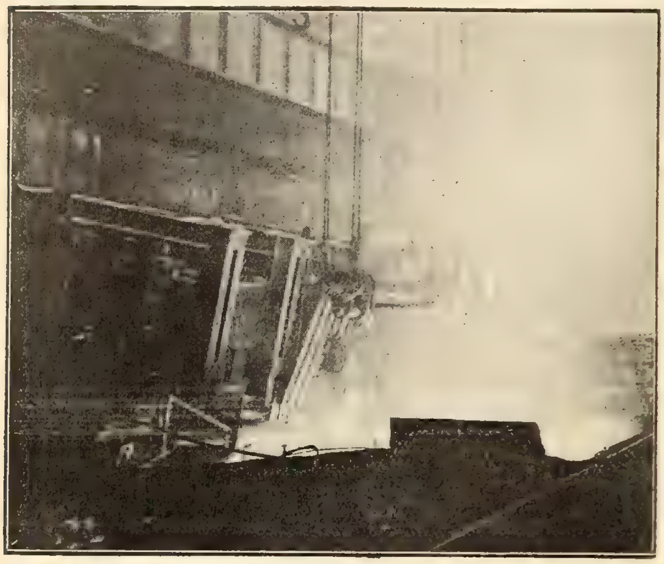


Charging Blown Metal Into 50-Ton Basic Open Hearth.

termed "Acid duplex," the Dominion Steel Corporation combines the basic Bessemer and the basic open hearth, so that the Bessemer blow removes not only silicon and carbon, but phosphorus as well, and although some portion of the refining is reserved for the open hearth, the latter functions rather as an equalizer and deoxidizer.

When duplexing was first introduced at the Dominion Works in May, 1907) an Acid Bessemer lining was used, with results which, though gratifying, were still con-

sidered somewhat short of the possibilities and it was determined to try blowing on a basic lining. This was a somewhat daring step in view of the fact that at least 1.80—2.00 per cent. of phosphorus is usually considered the low limit in basic Bessemer iron; however, Mr. F. W. Harbord, the distinguished English metallurgist, pronounced the scheme a metallurgical feasibility, the



Tapping a 50-Ton Furnace.

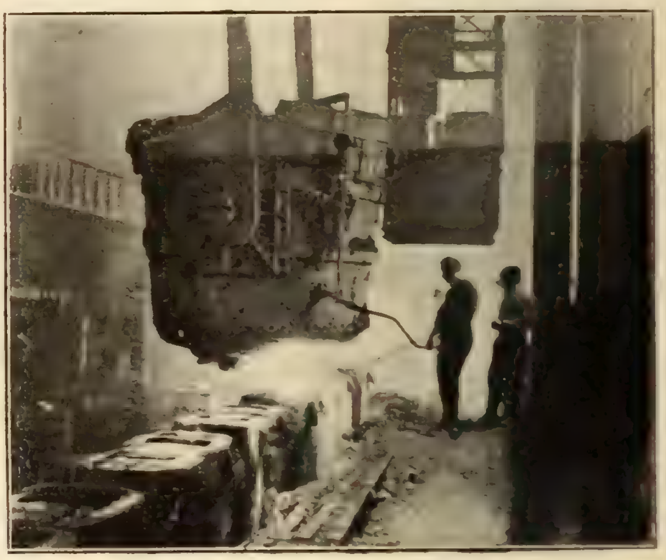
necessary lime bins and charging and mixing machinery were accordingly installed, the mica schist lining of the acid vessels was changed to one of stamped dolomite and tar, and basic Bessemer blowing was begun without the smallest hitch, and is regularly carried on at the present time. As a result the average monthly ton-

Recarburization in 50-Ton Ladle.

nage of ingots has mounted above the 30,000 mark as against a former average of 24,000 or less.

The Bessemer Lining.

The converters are lined throughout with stamped dolomite and tar. The dolomite, which must be the purest, is from the quarries of the corporation, at George's River, C.B., and burned at the steel plant in natural draft kilns, using coke for fuel. Carefully selected portions of the calcined material are ground to pea size, and thoroughly mixed with 10 to 15 per cent. of anhydrous tar (one of the by-products of the Corporation's coke plant) in a steam-heated mixing machine of special design, the greatest care being taken to exclude moisture. The lining is rammed up in three separate parts, the nose, the bottom, and the vessel proper. For lining the vessel proper,a hollow cast iron core in three sections is centred within the shell, which during relining remains suspended in its housings. Into the space between shell and core the hot air and dolomite mass is rammed with heated rammers. A wood fire is then lighted within the core and the lining thoroughly baked. Ramming and baking must be performed with the most scrupulous care, or the life of the lining will be seriously curtailed. Bottoms are rammed up in the conventional way (see Harbord and Hall, "The Metallurgy of Steel, 1911," p. 58 et seq.) a large number of baked bottom plugs being kept constantly on hand. Under Sydney practice twenty to twenty-five heats are obtained from one bottom and 180 to 200 on a lining, the bottom being renewed when necessary by



Teeming Ingots From 50-Ton Ladle.

means of an hydraulic jack tar, run beneath the vessel. From forty to forty-five hours are required for lining the vessel, all ofwhich must be conceded to be extremely good basic practice.

The Blow.

From 2,600 to 2,800 pounds of burned lime are charged into the empty converter, and on this about eleven tons of fluid pig iron from the metal mixer. The blast is turned on (at 18 to 20 pounds pressure, the tuyere plate having seventy-three ¾-inch holes) and the vessel turned up. Silicon and carbon flames, the "boil," the "drop," and the "after blow" (timed to two minutes' duration, more or less, according to the iron, the age of the lining and the condition of the bottom), follow in that order, and the vessel is turned down. The slag is then skimmed into a cast iron box car, and the metal thereafter poured into a ladle and transferred to the open heart shop. The entire basic blow occupies from twelve to fifteen minutes.

During the after-blow the phosphorus is oxidized to phosphoric acid and retained in the slag as calcium phosphate. If this stage of the operation be unduly prolonged, the iron of the bath becomes oxidized, and a replacement of phosphoric acid by iron oxide appears to take place in the slag, with corresponding reversion of phosphorus into the metal. If, on the other hand,

the after-blow be cut short, the phosphorus is only partially removed. It will be seen, therefore, that the blower's task is no mere matter of routine, but requires the constant exercise of good judgment and unremitting watchfulness as to lining, raw metal, flame and slag. Under good average practice the blown metal at Sydney contains:

	Per cent.
Carbon	.03
Phosphorus	.07
Sulphur	.05
Manganese	None

and the slag is constituted as follows:—

	Per cent.
Silica	13.0 to 14.0
Alumina	1.00
Lime	48.0 to 51.0
Magnesia	2.0 to 4.0
Phosphoric acid	17.0 to 19.0
Manganous ovide	1.5
Iron Protoxide	13.0 to 15.0

Open Hearth Treatment.

The open hearth furnace, "patched," if necessary, after the previous heat, receives three or four charging boxes of burned lime (in all, perhaps, four thousand pounds) and from six to eight tons of molten mixer metal. The silicon of the iron is oxidized to silica, which, with or without addition of fluorspar, combines with the lime to form the necessary slag. Five pots (the product of five blows) of Bessemer metal are then charged as rapidly as they can be had from the converters, and shortly thereafter the heat is ready for tapping. The six to eight tons of mixer metal above mentioned is so calculated as to give sufficient carbon for the "reboil" (which effects complete deoxidation of the blown metal and produces a true open hearth steel) and for as close an approximation as possible to the carbon desired in the ingot. Excess carbon is removed by ore addition, and carbon shortage is made up either with pig iron in the furnace, or with coke in the ladle. Ferro manganese and other desired alloys, are added in the usual way. The whole operation, from the first pot of metal to the tap, occupies only from two to two and a quarter hours, as against eleven to twelve and a half hours, the time normally required for a straight open hearth heat. Labour and fuel cost thus become extremely low, and ore cost is practically eliminated: brick repairs are also somewhat lower, because the duplex is always hot, instead of being subjected to the alternate heating and cooling necessitated by the direct process.

A by no means insignificant factor in the economy of the basic duplex process above outlined is the revenue from the Bessemer slag, which, when ground and prepared by the Cross Fertilizer Co., of Sydney, appears on the market as "Scotia Basic Slag" (Thomas Phosphate Powder) and is a most valuable fertilizer, practically the entire phosphate content being "available."

TORBROOK IRON DEPOSITS

The Development of the Torbrook Iron Deposits by the Canada Iron Corporation, Limited.

The territory embraced by the titles of this company extends practically from the county line between Annapolis and Kings counties westerly to the Nictaux River, a distance of over five miles, and has a width throughout its entire length of one and one-eigthth miles. This district may conveniently be divided into two sections, namely, the north and south section. The veins of iron ore run nearly east and west. The north section contains the outcrop of three veins of ore and the south section the outcrop of two. The outcrops of the north and south sections run parallel to each other. We have every reason to believe they form the upper edge of a syncline of continuous veins of ore, that is, the outcrop on the north dips under the intervening valley and outcrops again in the south section along the edge of the south mountain. The northern outcrop has been prospected very extensively. The eastern end of the outcrop has been exploited by the workings of the Leckie mine and by numerous drillings and surface pits. The Leckie mine on the Hematite vein was operated by an incline shaft to a depth of 350 feet, levels being broken off 50 feet apart and extending east and west many hundred feet. These workings have produced 350,000 tons of merchantable ore, averaging 51.1% Fe.

About one mile west from the Leckie mine a test pit was sunk 165 feet on the Shell vein. This vein proved to average 5½ feet in thickness. A cross-cut north was driven at the bottom of this pit to prove the existence of the Hematite vein. This was intersected at about 100 feet.

Two miles west from the Leckie mine an incline shaft, known as No. 1 mine, was sunk 170 feet on the Shell vein, which at this point averaged over six feet in width, and in many places widened out to 10 and 14 feet. Levels were broken off this shaft at intervals of 80 feet and are driven several hundred feet in either direction, proving a large body of shell ore to exist at this point. A crosscut was also driven north at the foot of this shaft to the Hematite vein, which was intersected at about 112 feet.

Equipment at No. 1 Shaft:—Boiler power; four 125 h.p. McDougall ret. tube boilers 72 in. x 16 feet, with 60 feet 34 inch steel stacks.

Air Compressor:—One Laidlaw-Dunn-Gordon, two stage cross-compound steam cylinders 15 x 24 in. Air cylinders 24 and 15 in. Stroke 24 in. Capacity 1,600 feet of free air per minute at 127 r.p.m. pressure 85 lbs.

Electric Plant:—One 34 k.w., A.C.B. generator 240 volts direct connected to 9 x 10 horizontal Robb engine. One 250 K.V.A., C.G.E. 60 cycle 3-phase 2,300 volts alternator. 600 r.p.m. belt driven from 18x20 Robb slide valve engine. One C.G.E. exciter 12 k.w. 125 volts, 1800 r.p.m. belted to alternator.

Water Supply:—One 2 stage McDougall turbine pump direct connected to 15 h.p. motor. Capacity 50 gallons per minute against head of 150 feet.

Winding Engine: One Georgian Bay Engineering Co. 12 x 15 double drum, geared winding engine with 5 foot drums.

Employees' dwellings:—Twelve cottages have recently been erected at No. 1 mine to accommodate employees. These cottages are furnished with running water and electric light.

No. 2 Mine.—The main shaft of this mine is situated about half a mile west of No. 1 and is sunk to a depth of 500 feet on the Hematite vein. Levels are broken off at intervals of 100 feet on either side. This shaft is 7x14 feet, and has three compartments, two for skips and one for a ladder and pipe way. The levels extend from 500 to 1,200 feet on either side. About 200,000 tons of ore is already blocked out in the Hematite vein. The Shell vein has also been opened up by cross tunnels from Nos. 2 and 5 levels, and at this point lies about 90 feet to the south of the Hematite. The thickness of this vein here is about 7 feet. A large block of this ore is ready for stoping.

The method employed for working these mines is ovrhead stoping. The main levels are cut out about 12 feet high. They are timbered and lagged over with poles to a height of 7 feet. Chutes are installed every 20 feet. The stoping begins above the pole lagging, the ore being blasted on to the pole lagging and loaded by gravity through the chutes into one-ton cars. The walls being solid, very little timber is used in the stopes. For driving the levels, No. 43 L.G. Canadian Rand drills give good satisfaction. In the stopes, Murphy hammer stoping drills are in use. The explosive used is 50% dynamite, it takes about one-half pound of dynamite to procure a ton of ore. Two skips, each two tons capacity, working in balance and operated by a winding engine, raise the product of this mine to the surface. The skips automatically dump the ore in to two No. 6K Gate crushers placed on foundations 35 ft. from ground. The foundation of the crushers is placed inside the main headframe. The headframe is 65 feet high and 30 feet square at the base.

Torbrook Surface Plant

The ore is crushed to pass a two-inch ring. From the crushers the ore passes on a Zimmer steel plate conveyor. These conveyors are 4 feet wide and are operated by a jigging motion causing the ore to move forward at a slow rate of speed. This slow speed enables the conveyors to be used for picking tables if required. They are equipped with discharging gates at intervals through which the ore drops into a series of 50-ton pockets, and thence by gravity to railway cars which transport it to the concentrating mill at Nictaux.

Equipment at No. 2 Mine:—Boilers, two 125 h.p. McDougall ret. tube 72 in. x 16 ft., with 60 ft. stacks. One 65 h.p. McDougall ret. tub. 54x16 ft; one 65 h.p. McDougall ret. tub. 60 in. x 12 ft., and one Matheson ret. tub. 80 h.p. one 600 h.p. Erie feed water heater

Winding Engine.—One Georgian Bay Engine Co. winding engine, 14x18, double cylinder, double drum. Reversing engine capable of winding 7,000 lbs. 500 feet per minute.

Crushers:—Two No. 6K. Gates gyratory crushers

Conveyors:—Two lines of conveyors of the Zimmer type.

Steam Engine:—One Leonard Ball Tandem Compound, 13 and 22 by 12 in., operating crushers and conveyors.

Mine Pumps:—Two Knowles vertical sinking pumps, 14 x 7 x 14 in.

The mines are served by two spur lines of railway, the Dominion Atlantic from Wilmot, and the H. & S. W. from Nictaux Station. The latter line now handles the

output of the mine to Port Wade on the Annapolis Basin, where the Canada Iron Corporation have a loading dock for foreign shipments. The product of these mines at present is being shipped to Europe.

Concentrating Mill for Iron Ore.

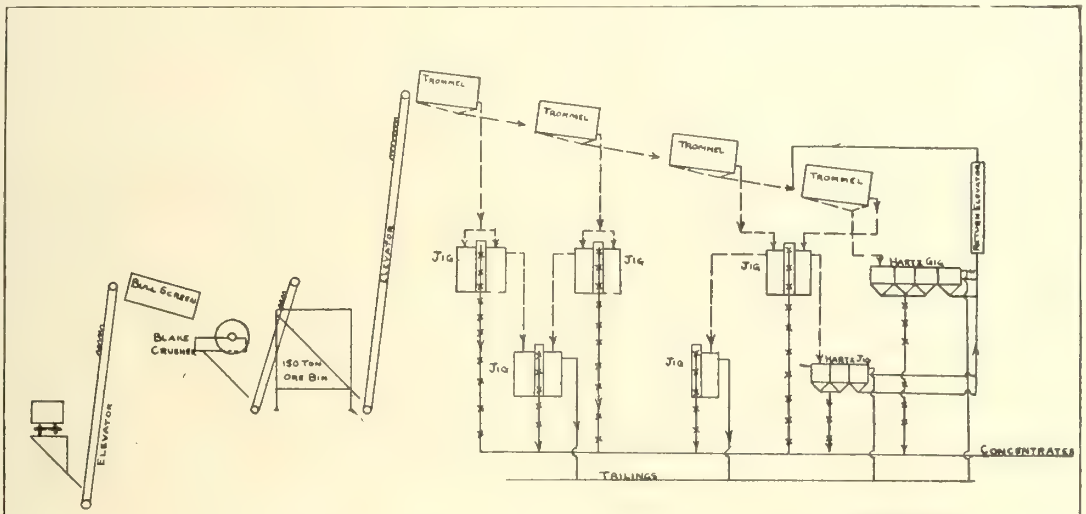
The crude ore produced at the Torbrook mines is put through a jigging process to wash out rock and low grade ore. The concentrating plant is situated at Nictaux Falls, two miles from the mines, and on the mines spur of the H. & S. W. railway. After being concentrated, the treated ore is shipped in 30 ton ore cars to the dock at Port Wade, on the Annapolis Basin.

The yard arrangement at the mill provides siding room for an incoming train of crude ore, with a 1½% down grade, so that individual cars may be dropped down by gravity, dumped, loaded up with concentrates and then dropped down until a train load is ready.

The crude ore as received at the mill has been crushed to pass a 2½-inch ring, but for good jigging it has been found necessary to further crush it to a 2-inch size. This is done by screening and crushing the oversize of 2-inch in a 24x12 New Century Blake Crusher. The entire product then passes to a storage bin and thence to the mill proper. From the storage bin the ore is elevated to the top of the mill in a continuous steel bucket elevator, 53 ft. centres. Here it discharges into a series of four trommels where it is classified into the oversize of 1⅜ in., ¾ in., ½ in., and ¼ in. and undersize of ¼ in. By referring to the accompanying flow sheet, the flow of ore may be readily followed. In general each size is treated twice, that is, the tailings from the first treatment are re-jigged.

The jigs for the treatment of sizes over ¼ in. are in many respects a distinct advance over any yet produced, and are capable of producing good results with ore as large as two inches. The jigs are 14 feet long, 14 feet wide, and 10 feet high, with two separate jigging compartments, and a centre compartment containing an elevator which recovers the concentrates produced, dewaters and discharges them to a concentrates belt conveyor. The sieve is 60 x 60 in., supported on grate bars and supports a bed of ore ranging from 6 in. to 12 in. dependent on the size of the material being jigged. The plunger is of a heavy cast iron construction 54 in. in diameter, working in a heavy iron cylinder with four inlet water valves 8 x 10 inches. An adjustable eccentric provides for a variation in the length of strokes. A 4 in. stroke at 100 r.p.m. is necessary to properly stratify a bed of 2 in. ore. The plunger shaft is fitted with tight and loose pulleys to enable the jig to be put out of commission without effecting other jigs. A worm conveyor carries the hutch product or what passes through the holes in the bed screens to the centre compartment where it is delivered to the concentrates elevator.

The heavier material on the jig bed rapidly works its way to the bottom of the jig bed and is drawn off at the front of the jig through a draw-off valve 48 in. long, while the lighter material passes over an apron on the top of the bed. This draw off valve is capable of wide adjustment. The concentrates after passing the draw-off valve fall down a 45 degree slope to the elevator boot in the centre compartment, where the elevator composed of 16 x 11 x 10 in. steel buckets carried on No. 111 Hercules chain elevates them, dewaters them and finally discharges them on a belt conveyor.



FLOW SHEET
50 Tons/Hr Iron Concentrating Mill Nictaux N.S.
Canada Iron Corporation Ltd.

The plunger of the jig is driven by an 8 in. belt from the main line shaft, while the elevator, worm conveyor and draw-off valves are actuated by means of sprocket chains from a centre shaft.

The retreatment jig for the oversize of ½-in. is a single compartment jig, sieve bed 36x48 in., and plunger 36x48 in.

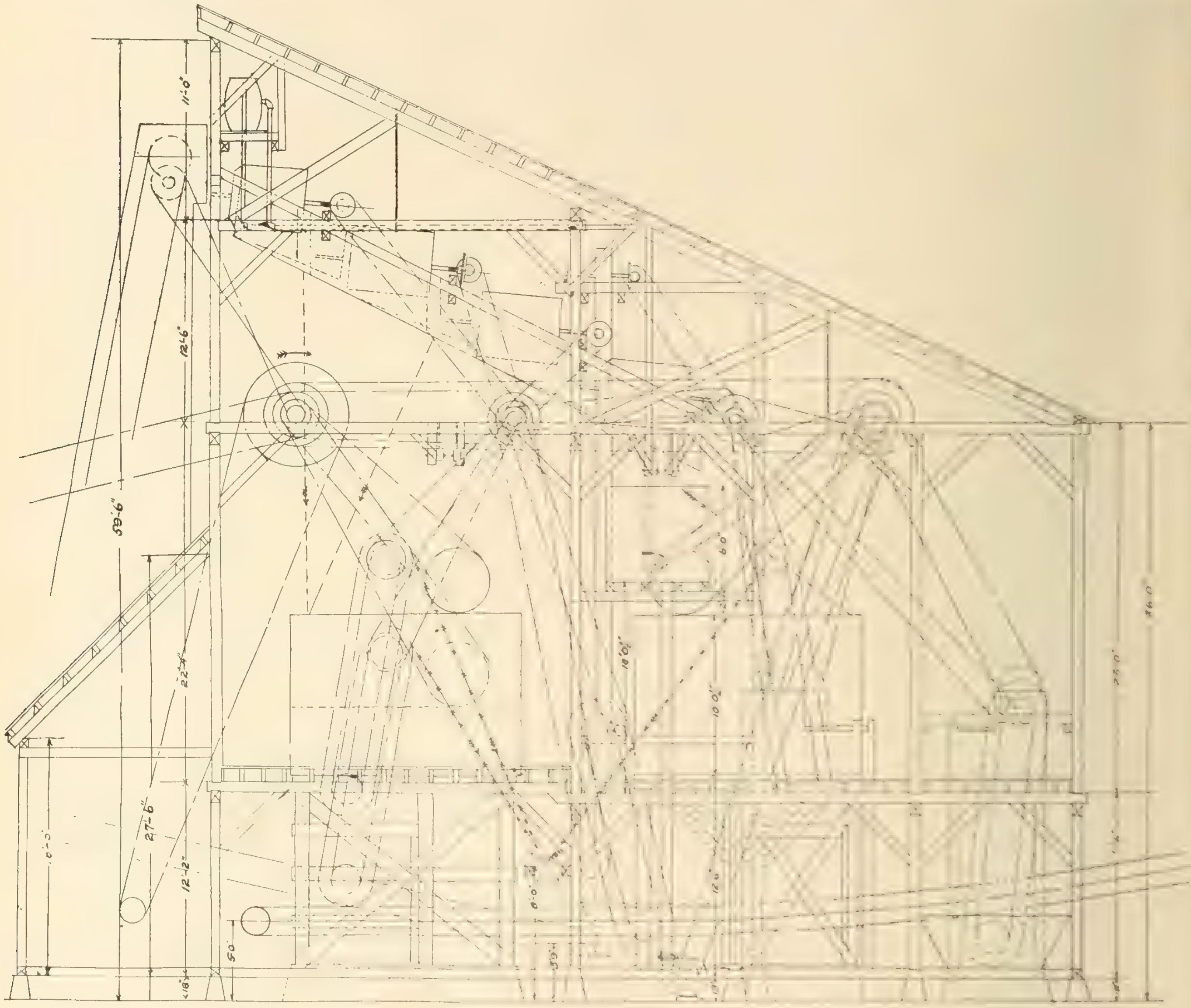
The retreatment jig for the oversize of ¼-in. is a three-compartment Hartz, with sieve beds 30x42 in., running at 125 r.p.m.

The jig which treats the undersize of ¼-in. is a four-compartment Hartz with sieve beds 32 x 42 in., running at 180 r.p.m. Concentrates are drawn off the bottom of each bed by an adjustable draw-off valve with the exception of the last compartment of these Hartz jigs; this product together with its hutch product is treated as middlings, and is flushed into a return belt elevator which discharges into the last two trommels and in consequence returns to its Hartz jig for retreatment. The hutch product and concentrates from all but the last cell of both Hartz jigs is flushed into a dewatering elevator which elevates and de-

waters these concentrates before discharging them on the concentrates conveyor.

All concentrates are conveyed by a 16-inch rubber belt to a 50-ton loading bin which is placed next to where the crude ore is dumped; after the crude ore is dumped from a car, this car is run under the loading bin and loaded with concentrates. Tailings are carried out of the mill on a 14-inch conveyor belt.

An interesting point in connection with this mill is the water circulation. The water is kept in continuous veyor belt. In this manner very little water is allowed to escape. It has been found necessary to provide means of drawing off a constant stream of water to prevent the circulating water becoming too thick with slimes. These slimes run very low in iron and high in silica and are consequently wasted. The method of doing this is by a spitzkasten or hydraulic classifier into which all return water is emptied. Here the velocity of the water is reduced to such a point that the slimes settle to the bottom and are drawn off through



END ELEVATION

ANNAPOLIS CONCENTRATING PLANT

AMERICAN CONCENTRATOR CO., JOPLIN, MO

circulation through the mill, being used over and over again, but replenished by a fresh supply of 300 gallons a minute to replace waste and to keep the circulating supply from becoming too thick. 2,000 gallons a minute are kept in constant circulation by an 8-inch centrifugal pump in the basement, drawing from the settling tanks.

Concentrates are dewatered with perforated bucket elevators. Tailings are run over perforated screens or gratebars before proceeding to the tailings con- a number of 1½-inch holes while the clean water is carried off from the top to the pump tank.

The mill is designed to treat 50 tons of crude ore an hour.

Two motors of 50 and 100 h.p. respectively operate the mill, and a 35 h.p. motor for the crushing department.

There are two sources of power, one a water power plant on the Nictaux River a quarter of a mile from the mill, the other an auxiliary steam plant at Torbrook.

A 30 foot head of water is available at the water power plant. For this purpose a concrete dam was constructed on the site of an old wooden dam; this dam is 230 feet long and 8 feet high, 130 feet being a spillway section. From the dam a wooden flume 400 feet long carries the water to the power house. Here is installed a 25 inch horizontal Jenckes turbine of 200 h.p., driving a 150 k.w. 3-phase generator, and a 4-in. single stage McDougall turbine pump which pumps 300 gallons of water a minute to the mill through a 6-inch C.I. pipe.

The auxiliary steam plant at Torbrook consists of an 18x20 Robb engine belted to a 250 k.w. General Electric generator. Three phase current at 2,300 volts is transmitted to the concentrating plant two miles distant by three No. 1 bare aluminum cables on cedar poles spaced 125 feet apart, part of which is located on a private right of way and the remainder on the H. & S. W. railway right of way.

The concentrating plant was designed by the American Concentrator Co., and the machinery installed by them; the remainder of the work was performed by the staff of the Canada Iron Corporation.

A sampling plant consisting of a Fraser & Chalmers sample crusher and grinder is attached to the mill. Samples of concentrates and tailings are taken every half hour, in addition to this special jig samples are taken every day to keep in constant touch with the performance of each individual jig. A sample monthly mill sheet is here shown, indicating how these results are kept daily.

There are numerous intrusions of rock in the Torbrook Mines, all of which rock is mined with the ore. This run of mine ore average 45% metallic iron, and after being put through the concentrating plant the iron content is increased to 51 to 53% with a corresponding reduction in silica and with a minimum rejection; this latter being now on the market for concrete and road material.

Port Wade Shipping Dock.

Concentrates from the Nictaux concentrator are carried by the H. & S. W. railway to Port Wade, a distance of 45 miles. Port Wade is situated on the Annapolis Basin, opposite the town of Digby.

A pier 850 feet long, 50 feet wide, runs at right angles to the shore out to deep water, providing a berth at the outer end for a steamer with 25 feet of water at low tide. The rise and fall of tide at Port Wade is 27 feet, this great tide made the rapid loading of steamers at all conditions of tide a difficult problem.

Plans were first considered for the construction of a long ore pocket to hold 7,000 tons on the pier, similar to docks on the great lakes. This construction, however, involved a greater expenditure than the conditions warranted, in addition to which there was a serious doubt of its stability under existing conditions. Consequently it was decided to adopt the plan so successfully used by the N. S. Steel & Coal Co., and the Dominion Iron & Steel Co., at Wabana, Nfld., and place the ore pocket on shore and load by a conveyor. This system has been installed at half the estimated cost of the original proposition.

The ore pocket is 150 feet long, 30 feet high, with sloping sides at an angle of 45 degrees and holds 7,000 tons of ore. Two parallel railway tracks at 14 foot centres on the top provide means of filling the pocket. The top is reached by a long railway approach with a maximum grade of 1.75%, about 150 feet is trestle, the remainder earth embankment. The pocket is constructed of hard pine throughout.

A tunnel runs under this pocket in which the conveyor is placed. The conveyor after leaving the ore pocket follows the pier level to a point about 150 feet from the outer end, where the grade of the conveyor alters from a level to 33% up grade, at the top of which the ore is discharged into a 200-ton pocket 50 feet above the pier level. From this pocket a heavy steel chute discharges the ore into the steamer. The chute is fitted with an automatic trimmer at its outer end which renders any hand trimming of the cargo unnecessary.

The conveyor is composed of 824 steel buckets each holding 1,000 lbs., and when operating at its rated speed of 200 feet per minute has a capacity of 2,000 tons per hour. It is 1,000 feet between sprocket centre and is consequently one of the longest bucket conveyors in the world. It is operated from the tail end sprocket by two 14 x 18 geared engines, capable of developing 300 h.p. Steam is furnished by two 125 h.p. 72 in by 16 ft. return tubular boilers at 125 pressure. The conveyor was manufactured by I. Matheson & Co., New Glasgow, N.S.

BY-PRODUCT COKE MANUFACTURE AT SYDNEY

By F. E. Lucas, Supt. Coke Oven Department, Dominion Steel Corporation, Sydney, N. S.

The coke plant consists of a coal crushing and washing plant and 500 ovens, each taking a charge of five and a quarter tons of coal, and one hundred and twenty ovens taking a charge of eight and a half tons each. Both lots of ovens are equipped with condensing house, ammonia plant, boiler plant, gas mains, etc., to enable the by-products to be recovered. There is also a sulphuric acid plant for making the acid, to recover the ammonia in the form of sulphate of ammonia.

The coal we are using, as is the case with practically all of the coals of the Maritime Provinces, has to be washed to remove sulphur and ash before making a good coke for metallurgical purposes. Types of washing plants almost without number have been devised for this work, but the one principle common to all, is that some means is taken to keep the coal sufficiently agitated in water so that the slate and sulphur, usually in the form of iron pyrites, can by reason of their greater specific gravity fall to the bottom. From there they are removed by various mechanical means. In giving a description of the methods of washing the coal, or preparing it for coking on this plant, it is not meant to imply that it is the best method in all cases. Before erecting a washing plant or other apparatus for the preparation of coal for coking, the particular coal to be used should be carefully studied and tested by every possible means. Different coals vary greatly in specific gravity and in the difference between the specific gravity of the coal itself and the impurities to be removed. The manner in which the sulphur and

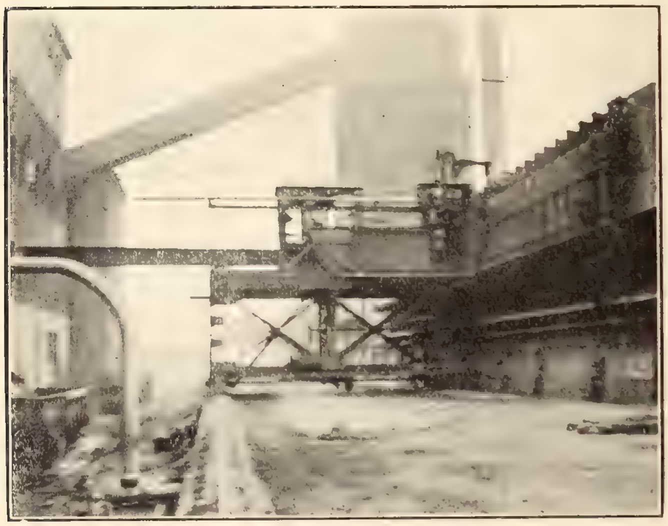
ash are associated with the coal will also be a determining factor in the type of crushing and washing machinery to be installed.

In the plant to be described the coal is first dumped through a long trestle about thirty feet high, having storage room for twelve thousand tons. Underneath this trestle are 30 inch belt conveyors so arranged that

Crushing and Washing Plant

they delive rthe coal to the incline conveyors which carry it to the top of the crushing building and deliver it into a hopper shaped bin holding 75 tons. From this bin the coal falls on a steel conveyor table which regulates the feed to the Bradford breaker. The breaker also acts as a dry cleaner, removing large scrap iron or pieces of pit props and ties which would damage the crushers if allowed to get that far. It also removes large pieces of slate and pyrites which are too hard to break while traversing its length.

The breaker is twelve feet long and nine feet in diameter inside. It consists of a steel plate shell ⅝-in



Pusher and Leveller

thick. This shell has 1¼-in. square hole a cloe together as the strength will allow. In between the holes at certain distances apart and arranged spirally are breaking blocks, presenting a wedge-shaped edge to the coal. There are also three shelves ten inches wide, spaced at equal distances around the circumference and running the full length of the breaker. Outside the breaker proper and concentric with it is a screen with half inch round holes. This is attached to the breaker shell by brackets. The breaker and screen are mounted on trunions and revolve at sixteen to nineteen revolutions per minute.

The coal admitted at one end is carried around by the shelves until the angle becomes such that it falls off through almost the full diameter of the breaker on to the sharp edge of the breaking blocks. This action is repeated several times before the other end is reached. The coal being carried forward by the spiral arrangements of the blocks. By the time the outlet is reached, if the diameter and length of the breaker have been properly proportioned for the coal used, there will be nothing left except, as stated above, pieces of wood, iron or stone. This material falls down a chute into a car. The coal which has passed through the 1¼-inch hole falls onto the half-inch screen. All that goes through this screen is fine enough for our purpose, the tailings falling first on the magnet belt to remove such small iron, as spikes, pick points, etc., and from there to the crushing rolls. The fine coal

Quencher and Loader in Action

from the rolls together with that from the screen then goes to an elevator which carries it back to the top of the building and delivers it to the belt conveyor, which in turn carries it to the bin over the washing tables in the main building.

The washing is done by means of Campbell tables. The tables are 9 ft. long by 2 ft. wide, with a curved bottom, so that there is about 5 inches of coal at the deepest part. The entire bottom is covered with riffles pointing toward the high end. The tables are supported, with a slight incline toward the end the coal is discharging from, by means of a rod at each corner so arranged that they can swing freely. In front of each table is a post against which it is caused to bump by means of a cam and rocker arm at a speed of [illegible] r.p.m. The coal comes on the table with the water at the high end and the agitation of the table causes the heavier particles to settle to the bottom where they are caught by the riffles. The successive bumps carry this heavy material ahead on the riffles to the high end of the tables where it is discharged into a chute and carried to the refuse bin, while the current of water flowing over the lower end of the tables carries the cleaned coal with it to the drainage bins.

The drainage bins have grid bottoms with sewers underneath which allow the water to drain back to

the pump pit and be used over again if necessary. From these drainage bins the coal is elevated to belt conveyors and carried to the storage bins over the ovens.

In describing the ovens we will take the larger ones as they are more modern and up-to-date than those of smaller size.

The ovens are of the United Otto type, 34 ft. long, 9 ft. high, and 17 inches mean width, having a taper of 4 inches in the length. They are supplied with two regenerators of ample size, which are alternately heated by the products of combustion on their way to the stack, and at stated intervals the gas is reversed and the air for combustion is drawn through the heated regenerator, by which means air at a temperature of twelve to sixteen hundred degrees is supplied for the combustion of the gas burned to keep the ovens hot.

The coal is carried from the storage bin to the oven to be charged, by a larry which holds the requisite amount for one charge, and is then dropped into the oven through five charging holes in the top. The charge is then levelled by means of an electrically driven levelling ram. The levelling is done in order to allow a free passage for the gas from all parts of the oven to the standpipe which is connected with the collecting main running across the top of all the ovens. After the charge is levelled the covers are put on and sealed with plastic clay to prevent the escape of gas. In twenty-four hours from the charging time the oven is ready to push. That is, the volatile matter has all been distilled off leaving only the fixed carbon and the ash that were in the coal plus a certain amount of deposited carbon. This deposited carbon is due to the breaking up of some of the hydro-carbons in the gas due to contact with the incandescent coke and oven walls. At this stage the doors at each end of the oven are removed by cranes attached to the pusher and quencher, and an electrically driven ram pushes the charge out into the quencher and loader. As soon as the ram is withdrawn the doors are replaced and sealed with clay and another charge is put in from the top as before.

The quencher and loader is a rectangular iron box slightly larger each way than the oven. Mounted on wheels with the necessary driving motors and gearing, and also water piping for quenching the charge. The bottom is a heavy steel conveyor. The door at the end next the oven is raised to receive the charge. When the charge is in the door is closed and the machine is run to the quenching station wheer connection is made with a water hydrant and sufficient water admitted to the box to quench the hot coke. The steam escapes through exhaust heads on the top. The door at the outside end of the machine is then raised and the machine traverses along the line of cars, at the same time the conveyor is started and the coke discharged into the cars where it is ready for shipment to the furnaces.

We shall now go back and follow the gas. Immediately the coal is charged into the oven it begins to give off gas. The volume of gas given off increases for several hours then gradually falls until shortly before pushing time it has all disappeared. This gas is received in the collecting main, before mentioned, that run to the quenching station where connection is made densing house. It reaches the first coolers at a temperature of approximately 250 degrees F., and is cooled to about 150 degrees F., and then enters a second set of coolers coming out at 60 degree-80 degree F. From here it passes through the tar scrubbers. These are so designed that in the passage through, the gas will get the maximum amount of friction. By this means, when the gas has been sufficiently cooled, practically the last traces of tar can be removed. After the tar scrubbers, the gas reaches the exhausters or positive blowers. These pull the gas from the ovens through the coolers and tar scrubbers, and send it out on the other side under pressure to the ammonia washers. The washers are so designed that the gas is brought into very intimate contact with water, which has a great affinity for ammonia. The colder the water the greater the capacity it has for absorbing ammonia. The water containing the ammonia is known as ammonia liquor. This is received in tanks in the basement of the building, the same as the tar, and from there pumped to storage tanks in the yard. The gas after leaving the ammonia washers is then ready for use. Approximately 50 per cent. of it is used for heating the ovens, the remaining 50 per cent., amounting to about 5,000 cubic feet per ton of coal coked, is sent to the holder and from there is used in the steel department in various parts of the steel making process.

The tar is pumped to the works of the Dominion Tar & Chemical Co., which adjoins the coke oven plant, and there it is distilled, and pitch, creosote oil, light oils, carbolic acid and various other tar products are recovered. The total tar recovered at the ovens is from 8-9 gallons per ton of coal carbonized.

The ammonia liquor is pumped from storage to the ammonia plant where it is distilled by steam and the free ammonia is driven off, then milk of lime is added to liberate the fixed ammonia compounds. It is then redistilled. The steam and ammonia, and certain quantities of carbonic acid gas and sulphuretted hydrogen from both distillations are collected in one pipe and conducted to the saturator, which is a large box filled with sulphuric acid and fitted with an exhaust outlet. The ammonia in passing through the acid bath becomes fixed as sulphate, and remains, while the steam and other gases pass out the exhaust. The temperature of the bath due to the combining of the acid and ammonia remains so high that the steam cannot condense. The bath becomes saturated and the sulphate of ammonia is precipitated as a white crystaline salt. This is then ejected by means of steam or air out on a draining board from which any acid drains back to the saturator. At the same time sufficient acid is added to the saturator to keep the bath sufficiently acid so that it will fix all the ammonia coming over from the stills.

The sulphate is scraped from the draining board into a centrifugal dryer which removes all moisture down to about 2 per cent. It is then put into the stock house and bagged ready for shipment. Sulphate of ammonia recovered is equal to a little over one per cent. of the coal carbonized.

In describing the plant I have been as brief as I could well be, and at the same time convey any adequate idea of the various processes as carried on. I have also avoided as far as possible operating details which would probably be of little interest to any one not actually engaged in operating a coke plant.

GOLD MINING IN NOVA SCOTIA.

(Written for the Canadian Mining Journal by H. B. Pickings.*

That the returns of the Department of Mines are considerably below the actual amount of gold recovered there can be no doubt. †These records do not include the years 1860 and 1861, and make no allowance for gold stolen by miners, disposed of as specimens, or made up in the form of pins, brooches and other small articles of jewelry; the value of the gold thus to be accounted for has been estimated at various amounts ranging from $1,000,000 to $5,000,000. An estimate of $2,300,000, sufficient to bring the total production of the province to $20,000,000, would, I believe, err on the low, rather than on the high side.

Early History.

The likelihood of gold being discovered in the province was mentioned by Sir Charles Lyell, in his Notes on the Geology of North America (1842); by Sir J. William Dawson in his Acadian Geology (1855), and by Sir Roderick Murchison in his "Siluria."

Power House, Dominion Mining Co., Tangier.

Several discoveries of gold were reported previous to 1860, the most authentic of which were probably those accredited to Captain L'Estrange in September, 1858, and the several discoveries reported to have been made by Mr. John Campbell, extending over the period from 1849 to 1860.

Gold mining, as an industry of Nova Scotia, however, commenced with the finding of several pieces of gold-bearing quartz in the bed of a small brook, at what is now known as the Mooselands Gold District, by John Pulsiver, in the month of May, 1860.

Pulsiver's discovery created considerable excitement and, in a short time, several hundred men were prospecting in the vicinity of his original find.

Work at Mooselands was discontinued before the close of the year 1860, and did not result in the finding of gold in any quantities. It had the effect, however, of encouraging prospecting at other places in the province, and gold was discovered at Wine Harbour by Joseph Smith in July, and at Tangier, by Peter Moser in October, but apparently no quantity of gold was recovered and prospecting was discontinued for the winter.

In the spring of 1861 work was recommenced at Tangier, Mooselands and Wine Harbour, and in a very short time several hundred men were engaged in prospecting and taking out quartz at these places, the number of men so engaged at Tangier alone being at one time during the summer, over 600.

New discoveries were made at many places and by the close of the year, areas had been taken up at Tangier, Mooselands, Ovens, Wine Harbour, Isaac's Harbour, Sherbrooke, Laidlaw's (now known as Waverley), Lawrencetown, Lynch's Farm (Sherbrooke), Malignant Cove, and Allen's Farm (Waverley). Actual mining operations had been commenced at Tangier, Wine Harbour, Isaac's Harbour, Country Harbour, Sherbrooke, and Laidlaw's.

Considerable gold was recovered during the year, but the exact or even the approximate amount is not known. There were no mills or crushing machinery of any kind at any of the districts—the gold recovered being broken from the quartz with hammers, and either disposed of on the ground or taken away in the specimen or nugget form.

The late Honourable Joseph How, at that time Provincial Secretary of the Province, in a report to the Earl of Mulgrave, dated September 4th, 1861, states "Though rumours have reached me of gold discoveries in many parts of the Province, and though the presence of gold in other localities has been ascertained beyond doubt, I do not think it prudent to include in this report any reference to discoveries which have not been thought of sufficient importance to demand the verification and direct action of the Government. At Tangier, Lunenburg, Lawrencetown, and Lake Thomas (Waverley), the facts collected are indisputable, and the interest taken in those mines by capitalists, at home and abroad, and by a very large number of the industrial classes, warrant Your Excellency in assuming, and so

*Inspector of Mines for Province of Nova Scotia.

†Gold mining has been carried on in Nova Scotia to a greater or less extent since the year 1860. The records of the Department of Mines show that [illegible] [illegible] tons of gold-bearing rock have yielded 931,550 ounces of gold valued at (at $19.00 an ounce) $17,699,450

reporting to the Secretary of State, that gold mining in those localities, whatever may occur elsewhere, will be permanently established as a new branch of industry, tempting to the capitalists, and attractive to the immigrant.''

During the summer the Government commissioned Mr. John Campbell to visit the Eastern, and Mr. Henry Poole, manager for the General Mining Association, to visit the Western Counties, and to report the results of their geological observations.

These reports were published in the Journals of the House of Assembly for the year 1862, they are most interesting, forming as they do, the foundation of the gold mining literature of the Province.

In the year 1862 a separate department of the Government was organized to look after the mining industry of the Province. The Department had at its head Mr. Samuel Creelman as Chief Gold Commissioner, and in this year the first Mines Report was published. It contained, in addition to a general report, short detailed reports regarding each district, and valuable statistics pertaining to production, men employed, etc., and shows that during the year mining was carried on at Tangier, Mooselands, Wine Harbour, Sherbrooke, Isaac's Harbour, Country Harbour, Renfrew, Oldham, Ovens, Waverley and Lawrencetown, and that prospecting resulting in numerous new discoveries of gold took place at various other parts of the Province.

At the close of the year 30 crushing mills or machines had been erected at the different districts, the estimated cost of which was $107,100. A total of 6,964 ounces was recovered from the quartz and other material treated by these mills and 311 ounces of gold was recovered from alluvial washings of ores, bringing the total production of the Province for the year to 7,275 ounces.

Gold mining has been engaged in continually every year since, new districts have been discovered, mines opened and equipped, modern mining and milling machinery have been introduced. To date, as already noted, upwards of $20,000,000 worth of gold has been recovered and the industry has given employment to from 300 to 1,200 men annually.

Renfrew Shaft House, M. J. O'Brien Property.

Geology.

Much has been written upon the geology of the gold fields of Nova Scotia, and it is hardly necessary to do more than deal very briefly with the subject.

Gold in Nova Scotia is found in quartz veins of both the interbedded and fissure types of varying thickness, from the fraction of an inch up to 30 and 40 feet, veins of from 2 to 8 inches, however, predominating. These veins occur in highly altered slates and sandstones of great geological age, now generally classed as Pre-Cambrian. These rocks occupy that section of the Province lying along the Atlantic Ocean, and Bay of Fundy, from the Strait of Canso in the east to Digby in the west, and extending inland from 10 to 75 miles, covering an area estimated at 3,500 square miles.

Granite intrusions in the form of large masses and dykes are numerous—the eruptive rock at places partially divides, but for the most part forms the northern boundary of the stratified gold measures.

These gold measures have a known thickness of about 30,000 feet, divided into an upper and lower series. The upper series, in which dark slates predominate, have a thickness of 11,500 feet. The lower series, in which quartzite predominates, have an estimated thickness of 18,500 feet. These rocks have been subjected to successive periods of pressure and uplift, and to cross-folding, and as a result have been formed into large domes and troughs having their axes generally east and west.

Metamorphism has accompanied the structural changes as shown by the sandstone, which has been generally altered to a very fine grained quartzite. Chlorite and muscovite have also been developed, the fine silt has been changed from mud to shale, and, finally, by the development of cleavage, it has become a true slate.

The quartz veins have, in places, been distorted until they resemble in shape corrugated iron, when small, and the backs of barrels, when large. These distorted veins have been locally termed "barrel" or "corrugated" veins; and have been by Rickard** termed "crenulated veins." A good example of one of the smaller of these "barrel" or "crenulated" veins is shown in the accompanying illustration of the Minnie Miller lead, at Caribou. "Crumples" and "rolls" are also very common and these crumples and rolls have been in many cases very productive.

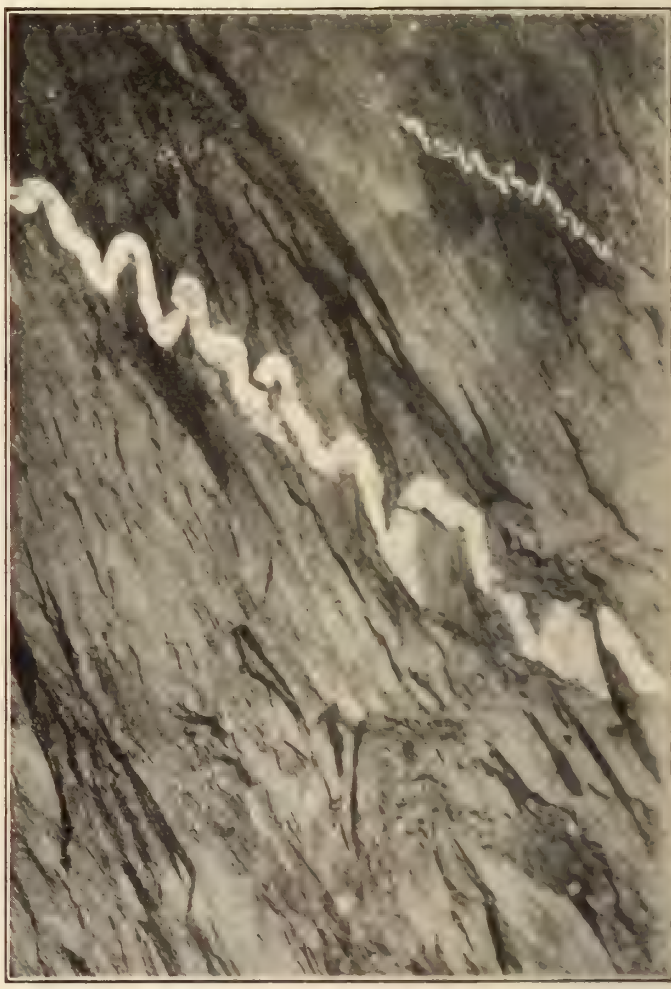
Faulting has been very general, and varying in extent from the large cross-country fault to small local faults of a few inches in extent only.

The present level or surface of stratified gold measures is estimated to be 30,000 to 40,000 below the original level or surface of these measures, this extent of the measures having been eroded and finally swept away by glacial movement, which indicates that the present worked section of the fields are on what was the middle or centre portion of the original measures.

The quartz is usually banded and of a bluish colour and almost always contains a varying percentage of arsenical arsenopyrite iron, pyrite, chalcopyrite, galena and zinc blende. The gold is generally very free from

Face of 340-ft. Level, Dominion Mining Co., Tangier.

Lake Vein, Lake Catcha.



Minnie Millar Vein, Moose River.

** "Domes of Novia Scotia," by T. A. Richard, Transactions of the Canadian Mining Institute, 1912.

impurities and when taken from the mortars and plates is usually worth from $19.00 to $19.50 an ounce.

Massive arsenical iron pyrites, when met in the quartz, are in many cases, important containers of gold.

The gold is usually found in the quartz in the form of irregular masses or nuggets, sometimes weighing as much as three or four ounces, or in small microscopic particles; occasionally it is found to a limited extent in the wall rock immediately adjoining the quartz. At a few places (notably at the Richardson mine at Isaac's Harbour), where large beds have been worked in which the quartz and slate are much mixed, the slate has been equally productive, indeed sometimes more productive than the associated quartz.

Small cross veins or "angulars" are numerous, often extending from one vein to another, at times apparently causing enrichment and impoverishment in the veins so intersected, and they have for this reason been termed locally, "feeders" and "robbers."

The distribution of gold in the veins is variable. Occasionally the distribution is fairly uniform over a considerable area of the vein, but more often it is confined to comparatively small, well-defined portions of zones outside the limits of which the vein will be found to be practically barren. In some veins, locally termed "Nuggety veins," at fairly uniform distances apart, "nuggets," or small isolated bunches or masses of gold are found, this condition oftentimes continuing over a considerable extent of the vein.

These specially enriched zones, or as they have been termed, pay-streaks, are well defined enrichments of from 10 to 100 feet in breadth, sometimes accompanied by enlargement in the size of the vein, they dip at constant angles; usually, but not always, they lie approximately parallel to the pitch of the nose, anticlinal axis of the structural fold. As to extension in depth, little is yet known. At two mines only has a vertical depth of 1,000 feet been attained.

The laws governing the occurrence and extent of these "pay streaks" cannot be said to have been as yet fully understood.

Districts.

There are, in Nova Scotia, upwards of 150 gold districts, among the more important of which may be mentioned Sherbrooke (including Goldenville and Cochrane Hill), Stormont (including Isaac's Harbour, Goldboro, Seal Harbour, Country Harbour and Forest Hill), Wine Harbour, Ecum Secum, Harrigan Cove, Salmon River (Dufferin), Fifteen-Mile Stream, Tangier, Lake Catcha, Montague, Waverley, Caribou, Moose River, Oldham, Renfrew, Gold River, Leipsigate, Brookfield, Malaga, Whiteburn, Mount Uniacke, and Rawdon.

At all of these districts, and at many more not mentioned, actual mining has been engaged in.

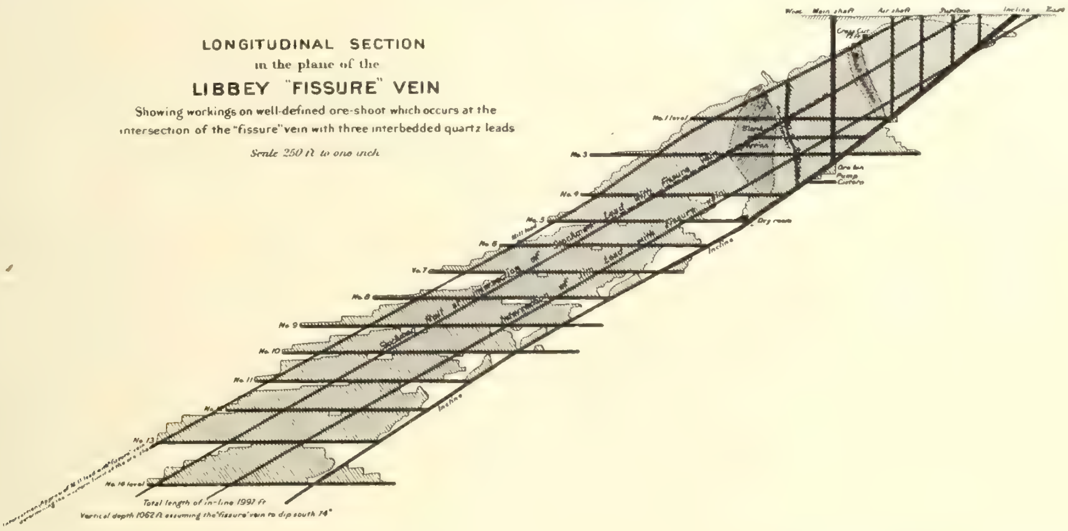
The districts producing the largest qauntity of gold are: Sherbrooke, $2,908,711; Stormont, $2,275,132; Waverley, $1,329,630; and Oldham, $1,277,102. The districts showing the highest average yield a ton are: Montague, with 1 oz. 8 dwts.; Whiteburn, 1 oz. 8 dwts.; Oldham, 1 oz. 3 dwts.; and Lake Catcha, 19 dwts.

The lowest average yield a ton is Stormont with 4 dwts, 14 grs. The average yield a ton for the Province is 9 dwts. 1 grain.

In all districts the areas are laid off in rectangular blocks 250 feet by 150 feet, having their longest lines running generally north and south. The extent of the districts varies, but are usually from $1\frac{1}{2}$ to 2 miles north and south, by 2 to 3 miles east and west.

Prospecting.

The surface material overlying the gold measures is composed of earth, clay and boulders, and rarely exceeds 15 or 20 feet, generally being from 5 to 15 feet. The usual practice in prospecting is to follow the quartz float or drift with trenches or pits running in a north and south direction, extending these to bed rock when the approximate position of the source of the drift has been located.



Mining.

Generally speaking, the methods of opening up and carrying on mining are as follows:

A shaft is sunk on the vein it is proposed to work, the shaft following the dip of the vein. Levels are driven off, on the vein, at varying distances of 50, 100 or 150 feet apart, and the vein stoped, usually by the back or overhand method. Ore chutes in the level are put in from 15 to 30 feet apart and the ore trammed to the shaft, where it is usually dumped directly into the skip or tub. The width of the workings depends upon the size and character of the beds accompanying the quartz vein, usually from 3 to 5 feet, the ore is either rough sorted below ground or the quartz is left standing, and taken down after the barren adjoining material has been scaffolded. Both skips and tubs are used for hoisting purposes, these running on wooden guides or steel rails,

and operated by steam, air, or electric driven hoists, dumping to ore pockets located at the top of the shaft house.

Air drills are almost universally used, the piston drill being used for sinking and driving, and the hammer drills for stoping.

The stopes and levels are timbered with stulls, the wall-rocks are usually strong and little timber is required.

The majority of the mines are comparatively dry and the pumps need to be operated for a few hours only each day, both the "Cornish" or "bob" and steam pump are used.

The Nova Scotia miner enjoys a good reputation both at home and abroad. He is intelligent, sturdy and accustomed to working in hard rock.

The present scale of wages paid at the gold districts is:

Shift bosses	$75.00 to	$100.00	a month.
Machine men	1.75 "	2.00	a day.
Machine helpers	1.50 "	1.75	"
Timbermen	1.50 "	2.00	"
Muckers	1.25 "	1.50	"
Engineers and hoistmen	2.00 "	2.25	"
Blacksmiths	1.75 "	2.50	"
Blacksmith helpers	1.50 "	1.75	"
Carpenters	1.75 "	2.50	"
Amalgamators	2.00 "	2.50	"
Millmen	1.75 "	2.00	"
Ordinary labour	1.35 "	1.50	"

Most of the districts are close to tide water or within a few miles of railway communication and little difficulty is experienced in transporting supplies.

Milling.

The usual mill practice in Nova Scotia is as follows: Ore from the mine is dumped into ore pockets at the top of the shaft-house, passing over grizzlies, the oversize going through jaw or gyratory crushers. From the ore pockets the ore is fed to the stamps by automatic feeders, the mortars are of the "Homestake" pattern, the stamps weighing from 800 to 1,200 pounds, the drop 5½ to 8 inches, and 70 to 110 drops a minute. The depth of discharge is from 6 to 12 inches. Wire screens principally are used of a fineness of from 24 to 48 mesh. The plates are from 8 to 12 feet in length, 4 to 4½ feet wide and set at a slope of from 5½ to 8 degrees, both the straight surface and drop plates are used, the straight plates, however, predominating.

Gold is recovered both from the mortars and from the plates, where the gold occurs very coarse, as for instance the Sterling mine at Oldham, as high as 95 per cent. of the total recovery is from the mortars, where very fine, as at the Richardson mine, the mortars do not give more than 10 or 15 per cent. of the total recoveries.

Concentrating tables (chiefly "Wilfley") are in use at about half of the mills, the product made equalling from 1 to 5 per cent. of the ore crushed, the concentrates yielding from $15 to $100 a ton.

Bromo-cyanide plants have been constructed and successfully operated at the Brookfield mine at Brookfield, the Micmac mine, at Leipsigate, and the Boston Richardson mine, at Goldboro; at the latter mine the concentrates only were treated, at the other two the mill tailings were treated. Several efforts have been made to treat old accumulations of tailings at some of the mines by the bromo-cyanide process, but the recovery has usually been so low as to cause the failure of such efforts.

The mills of the Province vary in extent from 5 to 60 stamps, mills from 10 to 20 stamps predominating. Roughly, 30 per cent. of the mills are operated by water power, some few by electric power, the remainder by steam.

Operations.

The most extensive underground workings in the Province are those on the Richardson lode at Goldboro, operated by the Richardson Gold Mining Company and its successors, the Boston-Richardson Mining Company and the New England Mining Company. The lode worked was from 5 to 20 feet in width, composed of quartz and slate, originally operations were carried on from three incline shafts following the lode and located, one on the north and one on the south legs of the fold and one on the nose of the fold. When a vertical depth of about 300 feet had been attained, a vertical shaft was sunk, located so that it would intersect the nose of the fold at a vertical depth of 400 feet; from this shaft levels were driven around both legs of the fold, the north level a total distance of 900 feet, and the south level 1,200 feet, the last 600 feet of drifting on the south level being for prospecting purposes only.

When the ore was exhausted above the 400-foot level an incline shaft was driven on the nose of the fold of the lode and levels driven from it at a vertical depth of 550 and 700 feet, stopes similar to those of the 400-foot stopes were worked on the north and south extensions of the 550-foot levels and the south extension of the 700-foot level. The mine was first opened in 1893 and was worked continually until 1910, the production during this time was 53,835 ounces of gold recovered from 395,-831 tons of quartz and slate crushed. The value of the gold recovered was $1,002,965, and the average yield a ton $2.58.

The deepest workings in the Province are those on the Libbey Fisher vein at Brookfield. The shaft is sunk on the lower limits of a pay-streak; measured on the dip it is 1,997 feet, the vertical depth being 1,062. Operations at this mine commenced in the year 1894 and were continued until the year 1905. The total production, 36,590 ounces of gold, was recovered from 93,611 tons of ore, the gold being valued at $725,210, the average yield a ton being $7.75. The accompanying longitudinal section of the workings of this mine show their extent and character.

At Caribou, on what is known as the "Lake lode," also a fissure vein, a vertical depth of 1,000 feet, was attained. The mine was worked by the Guffy-Jennings and Baltimore & Nova Scotia Mining Co. Operations were carried on from a vertical shaft 700 feet deep, crosscuts being made to the vein. From the 700-foot level west a winze was sunk between 300 and 400 feet. The total production of gold from this mine was 11,854 ounces, valued at $225,226, and recovered from 47,119 tons of ore, giving an average yield of $4.78 a ton.

Other extensive operations have been carried on at many of the districts, among which may be mentioned the Dufferin mine, Salmon River; the Royal Oak mine, Sherbrooke; the Micmac mine, Leipsigate; the Waverley and Tudor mines at Waverley; the Taylor Hardman mine at Oldham, and the New Edgerton mine at Fifteen-Mile Stream.

The maximum gold production of the Province was in the year 1898 when 31,104 ounces were recovered, the minimum production was in the year 1862 when 7,275 ounces were recovered, while the yearly average production was 19,101 ounces.

It will be seen from this that gold mining in Nova Scotia has never reached important proportions in comparison with which the industry has been carried on in

other countries, especially when considering the extent of the gold bearing measured. Before dealing with this phase of the subject it may be well to briefly consider the industry as it is to-day. At the present time gold mining of a limited extent is being carried on by the following companies:

S. R. Giffin & Company, Goldboro.

Goldenville Mining Company, Goldenville, Sherbrooke.

Boston & Goldenville Mining Company, Shiers Point.

Gladwin Mining Company, Beaver Dam.

Caribou Gold Mines, Caribou.

Stillwater Mining Company, Moose River.

Dominion Mining Company, Tangier.

Petpeswick Mining Company, Lake Catcha.

W. A. Brennan, Oldham.

M. J. O'Brien and associates, Renfrew.

Uniacke Mines & Power Company, Gold River.

Switzer Mining Company, Fifteen-Mile Brook.

Of the above operators the most extensive operations are being carried on by the Dominion Mining Company. This company is working what is known as the "Kent lead" at Tangier, a lead averaging about 18 inches in width; it is at present sinking at a depth of 675 feet, and mining from stopes over its 500-foot level. Its plant is operated by electricity generated at its water-power situated on the Tangier River about one mile distant from its mine. It is crushing monthly from 600 to 700 tons of ore and its recovery of gold is from 200 to 300 ounces.

M. J. O'Brien and associates are working what is known as the McLeod or "Nuggety Lead," at Renfrew; their main shaft is down 475 feet and they are now stoping from their 460-foot level. Their monthly tonnage crushed is from 200 to 300 tons. Their recovery of gold is from 100 to 150 ounces. Their mining power is steam and air; their mill "20 Stamps" is operated by water power.

The Boston & Goldenville Mining Company, at Shiers Point, has lately reopened what was formerly known as the "Moosehead Mine," the surface building and plant of which were destroyed by fire in 1900. It has constructed and equipped a new mill (20 stamps, 10 operated by water power and 10 by steam) and a new shaft house. As yet it has done little mining. The lode, on which work is being commenced, measures 4 feet in width and gives 20 inches of crushing material. Its main shaft is 200 feet deep, with levels east and west at this depth, 200 feet in extent each way.

At Caribou, the Caribou Gold Mines is working what is known as the "Ross Lead" and is prospecting and developing other leads from a vertical shaft 100 feet deep. Its workings are small and the tonnage handled as yet very limited. Seven hundred and fifty-four tons of ore crushed in 1911 yielded 850 ounces of gold.

The Switzer Mining Company is reopening the "Lowe Mine" at Fifteen-Mile Brook. As yet, no crushing other than small tests have been made.

At Lake Catcha the Petpeswick Mining Company is developing, stoping area, or what is known as the "Coleman Lead." A shaft has lately been put down to a depth of 460 feet and extensive levels driven east and west. In the east level a feeder of water was met, and for the time being work has been discontinued at the bottom level, and levels commenced east and west at a lesser depth.

At Goldenville, Sherbrooke, the Goldenville Mining Company is preparing to commence mining; it is at present engaged in completing the construction and equipment of a hydro-electric plant at Liscomb River, about 7 miles from its mine.

At the other properties mentioned prospecting and mining on a small scale is being engaged in. The industry at the present time is less active than has been the case for a number of years, and the production of gold for the year will not likely exceed 7,000 ounces.

Gold mining as an industry of Nova Scotia is now very inactive and, further, has never reached the proportion expected of it. The causes why the industry has not shown greater growth and is not to-day more active, are many. Space does not permit me to do more than deal very briefly with a few of the more important.

Probably the most important cause of unsuccessful gold mining in the Province may be attributed to the failure to recognize and determine, even in a general way, the extent, strike and economic value of ore shoots, or in brief to determine whether or not an ore shoot exists. And further, when the ore shoot is recognized to disregard the strike, and to sink a shaft that but a few feet from the surface deviates from it and soon necessitates long and expensive level extensions in order to mine it.

The next important cause of failing has been the non-determination of the probable life of the mine, by prospecting first and development later, a factor of particular importance where small veins are worked.

Again, Nova Scotia has long suffered along with other mining companies from mine promotion for sale of stock purposes and not mining at a profit. Nova Scotia is, unfortunately, particularly adapted for this class of operation on account of its geographical position and the fact that spectacular specimens can quite readily be obtained from almost any of the districts.

One other disastrous feature has been the all-to-frequent practice of trying to make a large mine on a lead of very limited extent, resulting in the loading of the property with a capital expenditure far in excess of what may ever be reasonably be expected to be returned.

Gold mining in Nova Scotia, undertaking with due regard to the limited size of the ore shoots and the location of shafts and other workings with proper respect to the strike of the ore-shoots from an economical standpoint, offers reasonable chances of success.

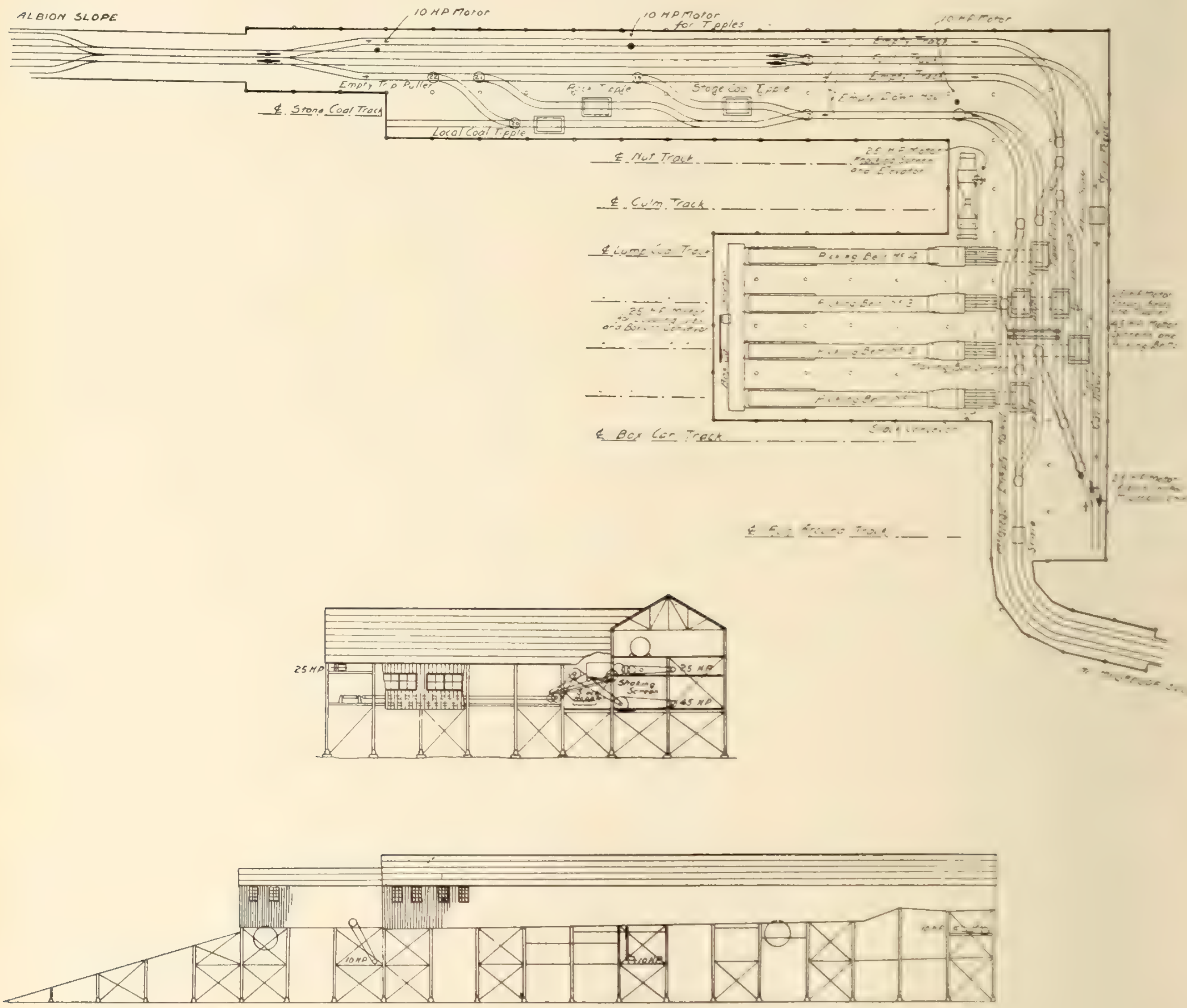
Mining in general, and gold mining in particular, in its initial stages, must always mean the outlay of money with seldom even equal chances of return. The Nova Scotia gold fields do not in this respect differ from other gold fields, and for the person or corporation who is prepared to undertake gold mining along conservative lines, Nova Scotia offers a promising field for investment.

NEW BANKHEAD AT ALBION MINES.

Acadia Coal Company, Limited, Stellarton, N. S.

Written for the Canadian Mining Journal.

Control of the Acadia Coal Company, Limited, whose mines comprise the Albion Colliery at Stellarton, the Allan Shaft at Stellarton, the Acadia Colliery at Westville, and the Vale Colliery at Thorburn, was recently acquired by a syndicate of Belgian capitalists, who instituted a vigorous course of development.



Among the first improvements decided on was the replacement of the surface equipment of the Albion Mines, which is the largest producing mine owned by the company. This scheme comprised the installation of a new bankhead to handle the output of two slopes, viz., the Albion, which produces about one thousand tons a day, and the McGregor, which produces four to five hundred tons a day. These two seams are worked from slopes, the openings of which are only some five hundred feet apart at the surface, so that utilizing one bankhead for the two mines was quite feasible. It was proposed to erect a modern steel frame bankhead with complete equipments of tipples, screens, picking belts, and all auxiliary machinery to handle an output of two thousand tons per day.

The design and erection, complete, of this whole work was trusted to the Brown Machine Company, Limited, of New Glasgow, N.S. In February, 1911, a contract was closed, and work was started in the early summer.

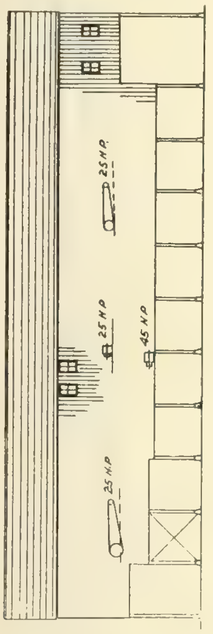
The bankhead has recently been placed in full operation, and the erection of all the plant and buildings was completed without any interruption to the working of either mine.

Before describing the layout of the bankhead, some of the other improvements added to the colliery might be mentioned.

At the Allan Shaft during the summer of 1911, the installation of a new steam turbine driven electrical plant was started, and cable laid underground to the Albion mine. This enabled a complete electrical hoisting equipment to be installed there, and each slope at

the Albion is equipped with a 300-h.p. Siemens Bros. geared hoist, operating with 3000 volt alternating current, and equipped with all the latest safety appliances for braking and controlling.

Two Walker compressors were also installed. These are rope driven by Siemens motors. All the auxiliary machinery for the bankhead and slopes is also being converted to electric drive.



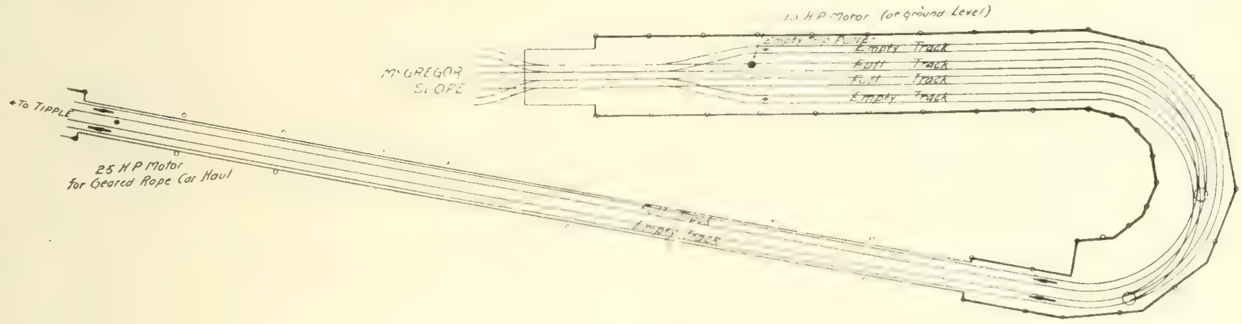
screens; also the elevator for slack coal to knocking screen, and the knocking screen for nut and culm coal. The upper floor at a general elevation of 35 feet carries all tracks and tipples, etc., to dump coal to screens. The picking belt house is 60 feet span by 90 feet long, joining to north side of tipple house, and has one floor only about 16 feet above grade, which carries the picking belts, etc.

The Albion approach is 35 feet span and 240 feet long, connecting slope mouth to tipple house, and has one floor about 24 feet above grade. It also contains three tipples and bins for handling rock, stope coal, and coal for local sales. The connection to the slope is by a steel trestle of five bents, 15 feet apart.

In the construction of the building 6 feet or 8 feet columns were used, except around screening plant, where 10 inch H columns are used, stiffened by 2-15 in. 33 lb. channels. All longer columns were made 8 in. H up to top floor, and 6 in. H column extensions spliced to them.

The floor beams through for main floor are 18 in. and 15 in. "I" beams, and the whole structure is thoroughly braced by heavy struts and angle cross bracing. The roof trusses are all 15 feet centres, and purlins are 6 in. channels with 2 in. by 6 in. wood nailing strip bolted on to take the roofing.

The plan used for floors was to keep all steel floor beams two feet below grade of base of rail, and a hard pine cap 8 in. by 10 in, was then bolted to steel beam. Under each rail a 6 in. by 12 in. hard pine stringer was placed, resting on 8 in. by 10 in. cap. Stringers 4 in. by 12 in. were used for floor not carrying tracks. On account of all tracks being graded, and



The Brown Machine Company, Limited, has supplied two 12 ft. 6 in. dia. by 4 ft. Clifford fans, which are now being erected. These fans are driven by 150 h.p. Siemens motors with rope drives. They were built by the Brown Machine Company, Limited, at New Glasgow, under the superintendence of the Clifford Fan Works, of Jeanette, Pa.

A number of new buildings were erected by the Acadia Company, for the installation of a Draeger apparatus, and new lamp and wash houses.

The Main Bankhead.

The specifications for the buildings called for steel structures throughout, and the building comprise: The McGregor approach, 22 ft. span by 135 ft., with curved portion same size connecting to a steel trestle carrying two tracks which join the McGregor and Albion bankheads. This trestle is about 320 feet long, with maximum height of 34 feet at delivery end. The main tipple house is 37 ft. span by 160 ft., with 42 ft. 6 in. posts. The tipple house contains three floors, viz., conveyor floor, elevation 14 ft. 6 in., on which are located slack conveyor, slack bins, and drive shafting for in many cases the grades varying considerably, this form of construction enabled the stringers to be framed into the caps to suit track grades. The main floors were laid with 3 in. by 6 in. surfaced spruce grooved flooring with ½in. by 1 in. hardwood tongues, and rails laid directly on this floor.

The floors in the picking belt house and the feeder and conveyor floors are of two thicknesses of 2 inch surfaced spruce, spiked to 4 in. by 6 in. nailing strips bolted to the steel. All outside floors, as on trestles and bank slopes are 3 inch deal.

The roofs of all buildings were laid with 1¼ inch tongued and grooved sheathings and covered with two ply rubberoid.

All the sides of the buildings are covered with 22-gauge corrugated iron, and an ample supply of light is furnished by placing two twelve-light windows in every 15 foot span, except in picking-belt house, where twenty light-frames are used.

The tracks throughout were laid with Nova Scotia Steel and Coal Co. No. 40 standard rails, and complete equipment of frogs and split switches were installed

Scheme of Operation.

The scheme of operation porvides for handling rakes of fifteen boxes, and each box contains about two thousand pounds of coal. The coal from the Albion mine is hoisted on a three-rail main haulage track, with passing-tracks halfway down the slope. When the rake is landed and uncoupled from the rope, it runs by gravity around curve to foot of rope car haul, where cars are taken singly to the tipple floor.

This car haul is a standard type of rope car haul, with hooks spaced about 12 feet apart, and travels at a speed of 36 feet per minute.

On reaching the top of the trestle the cars run by gravity to the scales and from there to the tipple. On being dumped, the cars runs through and crosses over to empty track to a kickback which starts car on return trip to mine. A short car haul catches car to raise it sufficiently to return to empty side of rope car haul which lowers it to McGregor bankhead. On leaving car haul the boxes are run by gravity to empty tracks where rakes are made up, and on each empty track near brow is a short chain trip puller which starts rake over the brow after coupling up.

The tipple used is of standard Brown Machine Company design, and consists of two heavy end castings connected with steel plate sides and cast iron seperators and provided with standard axle locking device, which releases the boxes automatically. The ends, and revolving part of tipple, are all assembled and treads turned off in one setting which insures a smooth running cage. The cage is mounted on rollers supported on cast iron frame, and drive mechanism is by a belt off main line shaft controlled by a standard 12-inch Brown Machine Company cone clutch. These tipples are capable of being operated at a speed of five boxes per minute continuously.

The installation in the picking belt house calls for three belts at present, with provision for one additional belt later. In describing the screening plant further, the course of the coal after having been dumped at any one tipple is the same for all the rest. Having taken the coal to the tipples, it is then dumped on feeder belts, which delivers to the screens. The feeder belts are Brown Machine Company design and consist of endless steel plate conveyors. The steel plates are cold pressed with curved lapover joints and are 3/16 plate, 4ft. long, attached to two strands of roller chain of 4 in. pitch. The chain and side plates of feeder belt are supported on a structural steel frame. The driving shafts are at outer end and are belt driven from main line shaft. The feeder belt delivers the coal to a set of cast iron moving bar screens. These bars have slots about 1⅛ in. by 9 in. long, and are worked by eccentries that give each alternate bar a horizontal and slight vertical movement, so that bars are working in opposite directions and the smaller coal is worked through the bars on the steel plate shaking screen underneath. The lump coal passes over end of bars to a chute which delivers it on picking belt.

Bank Head, Albion Mine

The shaking screens are 6 ft. 3 in. by 19 ft. long and have 1 in. by 2¼ in. perforations. The frame is of heavy angle and screen is supported by ¾ in. by 3 in. swinging rods with heavy forged ends bored and bushed for the pins. The screens are operated by eccentrics from the same shaft that drives the moving bar screens.

All the lump coal having been delivered to the picking belts, it is carefully picked and delivered to the cars. All coal for gondolas and hopper cars is loaded by lowering picking belt jibs through floor to car, and a cross belt conveyor for loading box cars is provided to take coal from picking belts and carry it to the west side of picking belt house where box car loader is situated.

The picking belts are standard B. M. C. design having seven inch flat plate and 1/4-inch thick, 5 feet long, with cast steel lugs riveted on and coupled together with 5/8 diameter rods. The belts are supported on 6 by 4 angles for upper belt and 3 by 3 angles for return side; these angles are supported at intervals by cast iron stanchions which are bolted to floor. The length of belt ais 40 ft. 3 in. to the knuckle, and jib extension is 21 ft., or a total length between centres of 61 ft. 3 in.

The loading jibs are raised and lowered by worm geared hoists driven off line shaft by a motor. The capacity of these belts is rated at 500 tons each per 10 hours, although considerably more can be carried.

The driving arrangement for feeder belt and tipples is grouped to one line shaft, and each tipple and feeder belt is separately controlled through an individual clutch. The screens, picking belt and slack conveyor are driven off main line shaft and separate friction clutch is provided on line shaft to separate each set of screens.

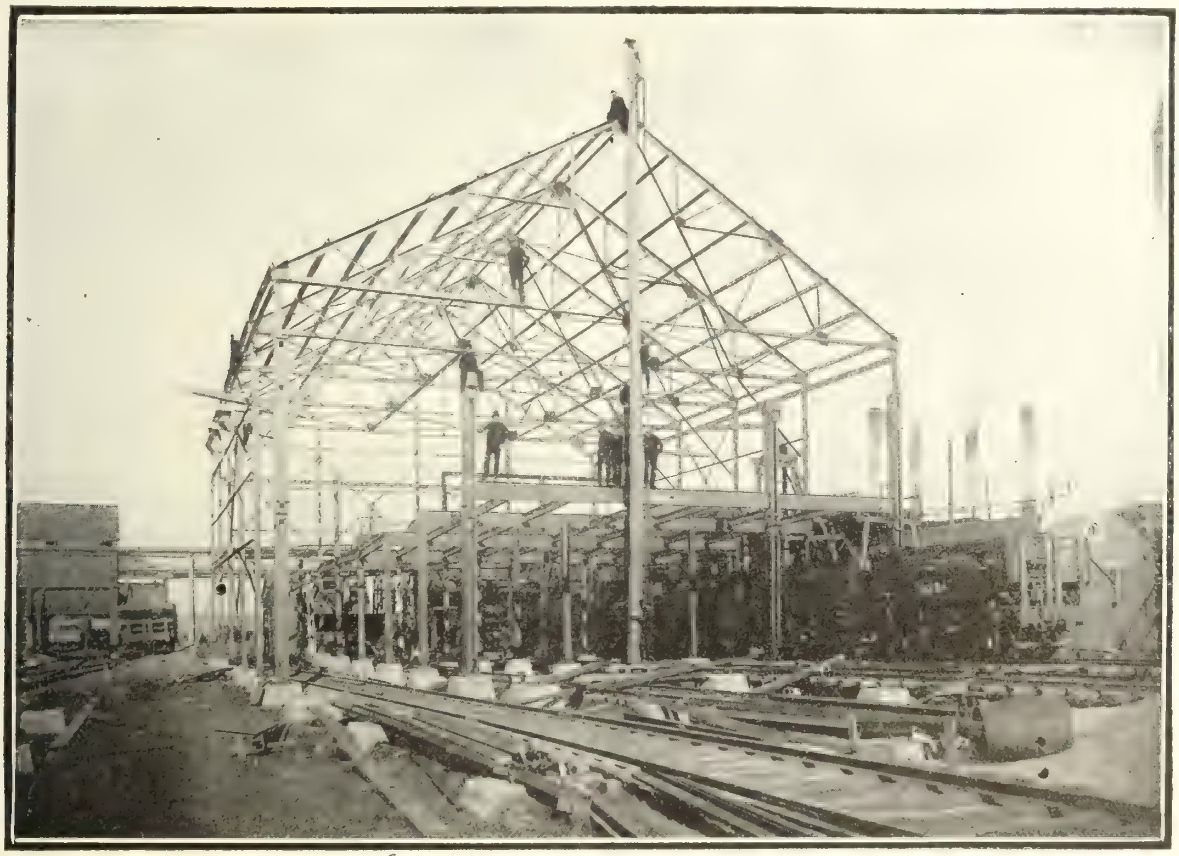
All slack coal from screens falls into hoppers with gates on bottom and these hoppers deliver it to a vibrating conveyor 6 feet wide, which carries the coal across building to an elevator. This elevator has a double set of buckets and a capacity of about 60 tons per hour, and by it the coal is elevated sufficiently to be delivered to a knocking screen, which separates the nut and culm coal. Hoppers are provided for each size and when shifting cars the gates may be closed and machinery run without interruption.

The above arrangement provides for making the following grades of coal; lump, run-of-mine, slack, nut, and culm. The run-of-mine coal is taken from screens to picking belt by putting veil plates over perforations in shaking screen, and the slack coal is taken direct from conveyor by opening a door in bottom of vibrating conveyor and letting coal drop through to car underneath.

The method of handling mine boxes for the Albion is as follows:

Rakes of fifteen cars each are delivered on bankhead and after uncoupling are run by gravity to a trip feeder which delivers cars singly to the scales. After the cars are weighed the main car haul raises them to the tipple floor. This car haul has hooks spaced 13 ft. 4 in., and a speed of 60 ft. per minute, and delivers cars on top of kickback which distributes cars to the different tipples. The maximum grade of this car haul is 32.38%, and the distance between the end shafts is 61 feet. This car haul, and also the one for the McGregor cars, are driven by a 25 h.p. motor, and an automatic braking device is fitted to prevent cars running back in case of any accident to the driving gear.

After passing through tipples, the Albion cars are returned to the bankhead by three down car hauls, two of which handle empty coal boxes and the third is used to lower the loaded boxes of rock and stone coal to the tipples over loading bins. The bins for domestic coal is also filled by transferring cars from main bankhead. The empty cars are assembled on two empty



Picking Belt House, Albion Mine

tracks, and a trip puller is provided on each track to start the rakes over the brow.

Besides the main machinery above mentioned all operating mechanism, rope pulleys, chutes, and hoppers were supplied complete and the plant was turned over to the Acadia Coal Co., Limited, ready to operate.

Albion and McGregor Bankhead

During the erection a number of difficulties had to be contended with, as all the new work had to be erected over old structures and all the existing tracks had to be kept clear until new tracks were provided. However, by putting in temporary posts and shoring up old work, by May 24th last all the new work had been put up and all the machinery was in place ready for operation, except 120 feet of the Albion approach and the slope bents. It was decided to connect up the McGregor slope first, and this was done on Friday, Saturday, and Sunday around May 24th; the slope being shut down for one day beside the holiday.

Tipple Floor, Albion Mine

To erect the balance of the Albion approach and tear out old machinery and buildings it was estimated that two weeks would be sufficient, and on Saturday afternoon, June 1st, work was started to tear down the old structures. By Sunday evening, June 2nd, all the old buildings, etc., were removed, and erection of the steelwork was started. All the steelwork was erected by Thursday, and by Monday, June 9th, all floors and tracks were laid and coal was hoisted over new bankhead on Wednesday, June 10th, or five days ahead of the time promised.

Screen and Picking Belts, Albion Mine

This bankhead is the first instance in Nova Scotia where one firm has taken a contract to furnish the equipment for such a plant complete, and all the structural steelwork, machinery, and other work was turned out of the shops of the Brown Machine Company, Limited, at Trenton, N. S.

Mr. C. W. Laing, lately construction engineer for the Dominion Coal Co., Limited, is chief engineer of the company, and was responsible for the design and turning out of the work from the shops. The field work of erection was in charge of Mr. J. A. Stairs

MANUFACTURE OF FIREBRICKS.

Written Specially for the Canadian Mining Journal.

The Intercolonial Coal Mining Company, of Westville, Pictou County, N. S., not only mines coal and prepares coke, but also manufactures fire brick. At present this is the only place in Canada where fire brick is made from native clay.

The company has three seams of coal on its property. Its principal workings are in the upper seam which is 10 to 14 feet thick. The main haulage slope is 8,800 feet long on a dip of about 14 degrees. The present workings are thus about 2,000 feet deep vertically. The slope is the longest haulage slope in Nova Scotia and the coal is being extracted from a greater depth than in any other mine in the Province.

There are two other coal seams underlying the one in which the main working is carried on. The bed of fireclay lies just under the third or lowest seam. The thickness of the clay bed or seam is 5 ft. 6 inches.

Dr. Ries made some physical tests on this clay during a recent investigation into the Nova Scotia clays and shales for the Canadian Geological Survey. He reports the following results:

"The shale in its ground condition worked up with 13% of water to a gritty but fairly plastic mass. Its air shrinkage is 3.6%, and average tensile strength 60 lb. per square inch. The wet-moulded bricklets behaved as follows:

"At cone 10, fire shrinkage 0 per cent., absorption 11.03 per cent., and colour buff.

"At cone 05, fire shrinkage 2 per cent., absorption 9.19 per cent., and colour buff.

"At cone 03, fire shrinkage 2.3 per cent., absorption 8.08 per cent.

"Ot cone 1, fire shrinkage 0.4 per cent., and absorption 4.80 per cent.

"At cone 3, fire shrinkage 4 per cent., absorption 5.04 per cent., and colour still buff.

"The bricklets were not carried above this temperature, but the fusion point was determined to be about 14.

"The clay can be worked in either a stiff mud or dry-press machine, and gives a good dry-press body at cone 03. with an absorption of 9.25 per cent."

In order to exploit the seam of clay a "stone drift" or haulage level was driven from the main slope to the fire-clay bed at a distance of 3.200 feet from the surface at a vertical depth of about 750 ft. Levels are first driven in the clay itself, back balances driven up in the bed and finally rooms broken off the balances. The pillars are left standing. The mining of the fire-clay is done practically altogether by blasting from the

Brick Kilns

solid. Slant holes from the sides of the walls are first drilled toward the centre at the top and then powder holes to the walls near the floor. The fireclay is loaded into cars, hauled through the "stone-drift" to the main hoisting slope and there dumped into large railway hoppers. It is thence hauled to the brick plant by locomotive.

The fireclay is dumped from the hoppers into the stock house and carried in barrows to be crushed in a 9-foot dry pen. A bucket elevator carries the dry ground clay to a double shaft mixer which discharges the clay mixed with approximately the right quantity of water to a small pug mill where the plastic mass is brought into the proper condition for pressing the brick. The pug mill discharges the clay to a six-mold stiff plastic machine where the brick is formed and partially pressed. This machine automatically discharges the molded brick to a toggle press where each brick receives its final pressure.

From the press the bricks are taken by hand and placed on the steel floor of a large drying house and dried by steam heat. If the bricks are placed on edge they will dry sufficiently in one day, but it requires two days if placed on end. The manner of placing them on the drying floor simply depends on the exigencies of burning in the kilns.

After the bricks have dried sufficiently they are carried in barrows to the kilns where they are stacked in the form of a long rectangular house with a pitch roof. They are so placed that there is an air space all around each brick. The kilns are rectangular down draft kilns with eight fireholes on each side. The fuel for firing is Drummond run of mine coal which is produced by the company. 35,000 bricks are placed in a kiln for each firing. The ends of the kilns are finally

Brick Kilns in Fire

all bricked up save for a peephole or two and the bricks are ready for the fire.

An esay fire is first started to drive on the moisture slowly, which part of the process takes about five or six days. Then the temperature is raised to the full firing point which is from 3000 deg. to 3200 deg. F. The temperature is judged by eye by the superintendent, and is also controlled by Seger cones. The heat is maintained at full fire for 55 to 60 hours, and then

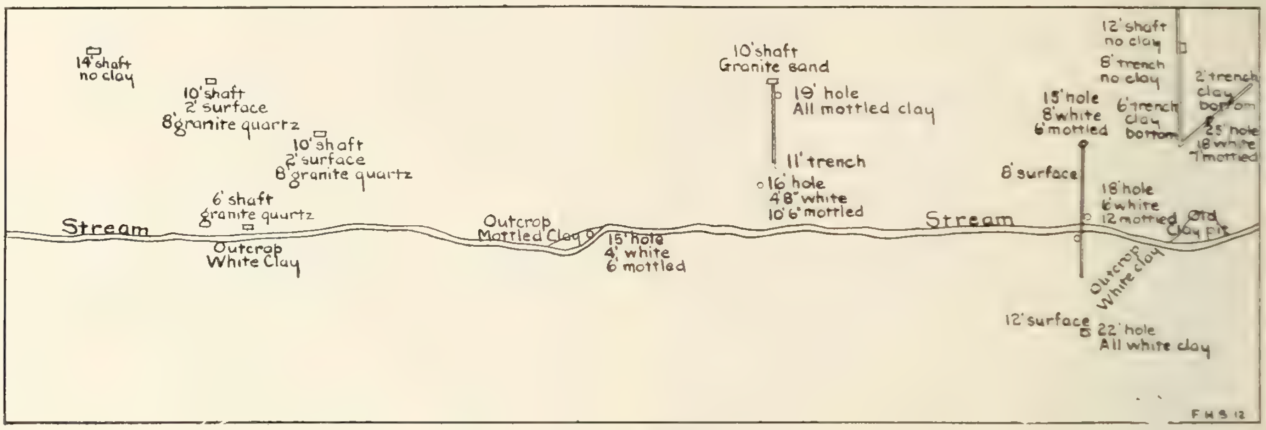
Fire Brick Plant

is gradually drawn down. It takes from five to six days for the kiln to cool off before it can be entered. The bricks are loaded directly into railway cars on the track which runs only a few feet from the front of the kiln.

Last year the company sold 657,000 fire bricks. These went to the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company. Both these companies find it to be the very best brick obtainable for lining ladles and slag cars.

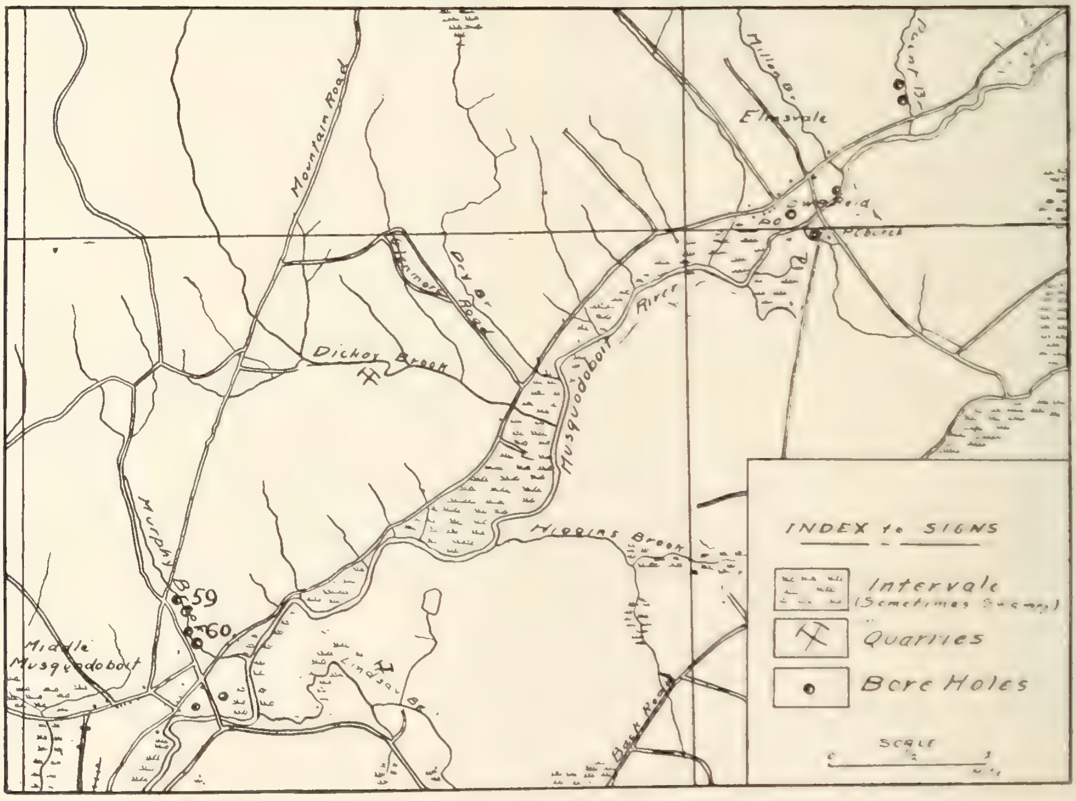
CLAY DEPOSITS OF MIDDLE MUSQUODOBOIT, NOVA SCOTIA.

There is a large undeveloped deposit or series of deposits of clay along the Musquodoboit River, near Middle Musquodoboit, N.S. The extension of these deposits is uncertain, but there are a number of outcrops for a distance of about seven miles from Murphy Brook at Middle Musquodoboit to Paint Brook, further up the river. These clays are now likely to be tested and perhaps exploited in view of the fact that the Halifax and Eastern Railway is now being constructed in close proximity to the deposits.



Sample Plan
Clay Deposit
Reid Farm, Middle Musquodoboit, N.S.

The clays are highly plastic and vary in color to a considerable degree. Some are white, some are dark gray, and some are mottled white and red. The red in the mottled clays seems to be due to the oxidation of particles of pyrites which were included in the sediment when it was laid down. The deposits appear to rest on bed-rock and are generally covered with more or less glacial drift. The geological age of the clays has not been exactly determined. The key to the age of the deposits may be found in scattered included lumps of lignite which have been observed in a number of places.



Map of a portion of a valley of Musquodoboit river.

Since the clays are covered with a mantle of glacial drift, these unconsolidated sediments are known locally as "underclay."

Dr. Ries, in a recent report (*) on the clays of Nova Scotia, refers especially to these deposits. It his opinion the "underclay" was laid down previous to the glaciation of the region, while the river valley was occupied by a body of still water, probably an arm of the sea. The clays may have been transported from the granite areas east of the present headwaters of the Musquodoboit River. During flood periods sands, silts and wood were washed in from the surrounding hills and deposited as impurities with the transported clay. Most of the iron oxide distributed through the beds of mottled clay was probably derived from the ferruginous slates which form the bed rock of the ridge on the north side of the river valley.

The clay deposits suffered severe erosion during the glacial period. The glacial drift, which consists mostly of a stiff boulder clay, contains a fairly large proportion of the "underclay" and occasional large masses of the latter.

The limited number of borings which have been made in these deposits show that there is not one mass of pure, high-grade clay as is generally believed in the neighbourhood, but that the occurrence is a stratified deposit of unconsolidated sediments made up of alternating beds of clays, silts and sands, with occasional layers of lignite and some concretionary iron pyrite. The sections obtained show considerable variation in the sequence and thickness of the beds even within short distances. This is evident from the borehole records given in a following paragraph.

The clay deposits are thick and of an unknown depth. The borehole records show the clays to a depth of 25 feet since this was about the limit of the apparatus. In boring for coal a few years ago a borehole was put down to a depth of 205 feet. At a depth of 65 feet they went through a bed of black clay about 10 feet thick and at a depth of 138 feet a similar bed carrying float coal and 15 or 20 feet thick was bored through:—

On property of Norman Deal, west bank of Paint Brook:—

	Ft.	Ins.
Soil	1	0
Bright red clay	8	0
Mottled red and grey clay	3	0
Grey sand	1	0
Mottled red and grey clay	8	0
Coarse dark red sand	0	6
Mottled red and grey clay	3	6
	25	0

On Paint Brook, 75 feet higher up stream:—

	Ft.	Ins.
Soil and gravel	3	6
Mottled red and grey clay	4	6
Light grey clay	2	0
Mottled grey and red clay	5	0
Dark grey clay	1	6
Mottled red and grey clay	1	6
	18	0

On road near Presbyterian church—patch of clay exposed on roadside:—

	Ft.	Isn.
Light grey clay	1	0
Coarse brown sand	4	0
Light grey clay	0	6
Yellow sandy clay	0	6
Mottled red and grey clay	3	0
Red and grey stratified sand, with some thin layers of clay	6	0
Mottled red and grey clay	1	0
Light grey sand	3	0
	19	0

Sections of the clay deposit on the lower portion of Murphy Brook show a body of clay from 17 to 20 feet thick, containing no sandy partings.

Borehole No. 1—Murphy Brook, about 225 feet above G. T. Reid's house (clay exposed in bed of brook):—

	Ft.	Ins.
Grey clay with some mottled red and grey beds	17	0
Silty clay	4	0
Mottled red and grey clay	1	0
	22	0

Borehole No. 2—Murphy Brook, about 400 feet above No. 1 (clay exposed at edge of brook):—

	Ft.	Ins.
Mottled red and grey clay	20	0
Dark grey clay, sand and lignite	1	6
Dark grey clay	2	0
Mottled red and grey clay	1	6
	25	0

Borehole No. 3—Murphy Brook, on west bank, 30 feet from brook about 250 feet above No. 2:—

	Ft.	Ins.
Soil	1	0
Mottled red and grey clay	1	0
Glacial clay	5	0
Dark grey clay	1	0
Red and grey mottled clay	1	0
Light grey clay	2	0
Red and grey mottled clay	1	0
Grey sandy clay	1	0
Red sand	1	0
White sand—water	2	0
	15	0

Borehole No. 4—Murphy Brook, about 250 feet above No. 3 (clay exposed on bank):—

	Ft.	Ins.
Light grey clay	3	0
Mottled red and grey clay	2	0
Mottled red and grey silty clay	4	0
Yellow, white and gray stratified sands.	9	0
	18	0

Borehole No. 5—On William McCurdy's property (clay exposed at edge of Musquodoboit River):—

	Ft.	Ins.
Mottled white and red clay	1	0
Grey clay	3	0
Mottled red and grey clay	8	0
Red and grey silty clay	3	0
Grey clay	4	0
Brown and grey silty clay	3	0
Grey and mottled clay	1	0
	23	0

The plasticity of the clay is generally good, even the silty beds possessing fair plasticity, and as the shrinkage

(*) The clay and shale deposits of Nova Scotia and portions of New Brunswick, Heinrich Ries, Ottawa, 1911.

of the latter is less than in the purer beds, they may be manufactured into higher grades of structural material, such as pressed brick and floor tiles.

The physical tests and chemical analysis of the clay is given below.

No. 1 clay from Borehole No. 2, Murphy Brook, 91.6 per cent. passed through a 200-mesh sieve. It worked up to a smooth plastic mass with 30.8 per cent. water, the air shrinkage of which was 6.5 per cent. and tensile strength of 68 lbs. per square inch.

Wet -Moulded Bricklets.

	Fire shrinkage.	Absorption.	
Cone.	Pct.	Pct.	Colour.
010	0.1	21.68	Salmon pink
05	2.6	18.29	Light salmon pink
03	6.	12.96	Light salmon pink
1	6.3	7.00	Pink
3	6.3	5.41	Pink
5	7.3	3.66	Red
9	9.	0.29	Red brown

The bricklets had a good body at cone 05 and were steel-hard at 03. They preserved their form at cone 9, but the shrinkage was rather high.

No. 2 clay from Borehole No 4, Murphy Brook: 99 per cent. passed through a 200-mesh sieve. Air shrinkage 6.8 per cent., average tensile strength, 81 lb per. square inch.

	Fire shrinkage.	Absorption.	
Cone.	Pct.	Pct.	Colour.
010	0.4	19.3	White
05	2.3	16.71	White
03	6.0	15.92	White
1	6.0	7.41	White
3	6.0	7.71	Cream
5	7.3	4.89	Cream
9	8.0	4.34	Cream

The bricklets were rather soft at cone 110, fairly hard at 05 and steel-hard at cone 1. The clay fuses at cone 27, and may be classed as a No. 2 fire clay, suitable for the manufacture of stoneware, face brick or terra cotta.

Chemical Analysis of Clay No. 2.

	Pct.
Silica	55.14
Alumina	28.84
Ferric oxide	1.91
Titanic oxide	2.37
Magnesia	0.25
Lime	0.38
Soda	0.48
Potash	1.88
Water	9.24
	100.49

Mr. F. H. Mason made an examination of a portion of the clay deposit on Murphy Brook for a length of about 1,200 feet in 1900. A prospector brought him a sample of the clay, which was a little off colour, due to organic matter, but which burned to a pure white colour both in an oxidizing and reducing atmosphere. The clay had an extremely high fusing point, which made Mr. Mason think it would be a high-grade fire clay.

An analysis of this clay showed the following results:—

	Pct.
Silica	50.90
Alumina	37.30
Oxide of iron	Trace
Lime	Nil
Fixed alkalies	0.65
Loss on ignition	11.19

He sampled the clay with a drive pipe provided with a footpiece shaped like a cheese sampler. This tool could be used to penetrate to a depth of about 30 feet. The accompanying plan shows the location of the samples and the kinds of clay in the sections obtained.

The different clays were analyzed by cutting V-shaped sections out of each section of the core, and the results were as follows:—

	Average sample white clay [illegible] bore hole.	Average sample mottled clay [illegible] bore hole.	[illegible]	[illegible]
Silica	53.20	63.91	52.90	53.00
Alumina	30.25	18.60	29.00	32.10
Oxide of iron	1.72	5.75	3.20	1.70
Lime	Nil	Trace	*	Nil
Magnesia	Trace	Trace	*	Trace
Alkalies	1.33	*	*	0.97
Loss on ignition	12.00	10.30	12.10	12.20
Titanic oxide	1.47	*	*	*

* Not determined.

The presence of quartz sand led Mr. Mason to conclude that the clay was a product of the decomposition of granite at some source from which the clay was transported. He also believed that the red spots in the mottled clay resulted from particles of pyrite because on close examination the mottled spots showed that the mottling radiated from centres or nuclei.

Mr. Mason was examining the deposit with one view, viz., the adaptability of the clay for the manufacture of firebrick. He sent samples of the clay to Col. W. [illegible] Trotter of the Standard Pipe Company of St. Johns, Quebec, who made some sample brick and placed them in the lining of a blast furnace. Col. Trotter mixed the clay with 25 per cent. of silica sand in order to make the test firebricks. The bricks did not stand the heat in the blast for more than 24 hours, so that Mr. Mason abandoned the project.

With the advent of the new Halifax and Eastern Railway, however, which passes directly through these deposits of clay, there is no doubt but that they will be further investigated. There is every reason to believe that one or more clay working industries will be established in this vicinity in the near future.

THE NOVA SCOTIA MANGANESE CO., LIMITED.

(Writen for the Canadian Mining Journal.)

[Editor's Note:—On another page the reader will find an abstract of Mr. H. E. Kramm's paper on the geological occurrence of manganese ores at New Ross, N. S. The following article and the abstract referred to, give in small compass the principal data concerning the only manganese deposit that is being worked in Nova Scotia.]

As long ago as the year 1813, the Crown issued a grant of 5,500 acres of land in the north-eastern portion of Lunenburg County (see map), to the Bishop of Nova Scotia for the support of Dean and Chapter. To this day the Church of England holds this property, and the current title by which it is known is "The Dean and Chapter Grant." The church authorities indulged in no prospecting, nor, apparently, did they seek to colonize the land. They merely cut the pick of the timber and praised God for that.

In the year 1907, a prospector named Turner, a native of New Ross, discovered a showing of manganese on the property. He set to work stripping and sinking test pits, and finally uncovered a promising vein of pyrolusite and psilomelane. Unable to develop the property himself, he was fortunate in securing the assistance of Dr. H. W. Cain and Mr. E. Norman Dimock, both of Windsor, N. S. After a considerable amount of prospecting and preliminary work had been done, the Nova Scotia Manganese Company, Limited, was organized to take over and develop the property. The company's first step was to secure a 99-year lease on the Dean and Chapter grant. The terms of the lease provided for the payment of a royalty, and transferred to the company for 99 years all the mineral rights of the 5,500 acres, together with the privilege of cutting all timber necessary for fuel or mining purposes. In addition to this the company secured from the Provincial Government exclusive licenses to search for manganese and iron ores over an area of five square miles.

Since its organization, the company has been active. For the past two years, about 20 men have been employed in prospecting, development, and construction. The first vein has been traced for a distance of 1,500 feet on the surface, and a shaft has been sunk to a depth of 165 feet. At the 150-foot level a station has been cut and drifts have been run for 200 feet on the vein. A second vein was discovered near the first, by surface prospecting; and there is evidence, from "float," of the existence of other veins. Meanwhile 450 tons of high-grade ore, containing from 85 per cent. to 95 per cent. MnO_2, have been mined. The company estimates that the ore immediately available in the mine amounts to 5,000 tons.

The Ore.

The vein being developed consists of a series of irregular, roughly lenticular masses mainly of pyrolusite, but also containing psilomelane and some manganite, associated with iron oxides in a more or less decomposed state. In some places these iron oxides are loose and friable, while in others they assume the form of a fairly compact limonite. The walls are of gray granite, slightly pegmatitic, and much decomposed on both sides of the vein. It is, therefore, necessary to keep all workings timbered up to the working face.

The vein dips at an angle of about 85 degrees, and strikes approximately east and west. It varies greatly in width. In places the ore pinches out entirely, giving place to iron oxides and to decomposed vein matter, while in other places it swells out to three, or even six feet of manganese ore. The proportion of manganese increases with depth as decomposition from surface agencies decreases.

The accompanying diagram, representing a portion of the drift, shows the general form of the vein and the size and relation of the ore bodies.

Equipment.

The surface equipment includes a saw mill and a shingle mill to supply building material; a combined shaft house and store house, which contains a small engine operating a hoist and a Cornish pump; a main power building containing an 80 h.p. return tubular Robb boiler and a 50 h.p. engine; and the concentrating mill building, 66 feet by 59 feet, one and one-half storeys high. Besides these structions, the company has erected an office, a bunk house, a storehouse, and stables.

The mill equipment consists of a Sturtevant jaw crusher, a sample grinder, three Newago vibrating seperators, several Richards jigs, and a Wilfly table.

General.

The lack of adequate transportation is the principal difficulty that has had to be faced; and it has not been overcome. The mine is situated 20 miles in a south-westerly direction from the town of Windsor, and 10 miles north of the village of New Ross. It can be reached either from Chester Basin on the H. and S. W. railway, or from Windsor. The distance by road from either point is 29 miles; but the last seven miles are passable for vehicles only in winter. Naturally this has been a very serious obstacle and has entailed much otherwise unnecessary expenditure. Machinery and supplies must be hauled in during the winter by ox-team, and all shipments of ore have to be taken out in the same manner. However, the company is now constructing 9¾ miles of wagon road from the mine to Benjamin's Mills, whence a haul of 3¼ miles will permit of taking the ore to Mud Bridge, a landing on the Avon River. Here the ore can be transferred to lighters and towed down to Windsor, where it can be distributed either by rail or by water.

The value of the manganese ore depends upon its relative purity and upon the use to which it is to be put. Prices range from $15 to $400 per ton. The product of the Nova Scotia Manganese Company, it is believed, will bring an average price of $25 per ton. Recent shipments made to the Humphrey Glass Company, at Trenton, New Jersey, and to the Brandram-Henderson paint works at Halifax, brought from $50 to $80 per ton. The shipments are reported to have met all the requirements.

THE OCCURRENCE OF MANGANESE AT NEW ROSS, N. S

The following is an abstract of a paper presented by Mr. H. E. Kramm, of Cornell University, at the annual meeting of the Canadian Mining Institute, held in Toronto in March last:

Deposits of manganese ores are found in many localities throughout Canada; but production in commercial quantities has been limited to that obtained from mines in the Provinces of Nova Scotia and New Brunswick. In Nova Scotia, the mining of manganese was inaugurated in 1861; but no considerable production was made until 1887, and even in that year when output attained its maximum, the yield was but 691 tons. The exports in 1887 were 578 tons, valued at $14,220. Since then the production has been declining and erratic.

The Nova Scotian ores are usually found in the form of oxides in association with sedimentary rocks, such as limestones, shales and conglomerates of the Lower Carboniferous series. The deposit to which reference is here specifically made, is situated about 10 miles to the north of New Ross. The ore occurs in two fissure veins in granite, known respectively as the "Old" and "New" mines. Both veins strike about N. 50 degrees E., dip between 70 and 90 degrees, and have widths ranging from zero to a maximum of 70 inches.

The Old Mine was worked for a period of about three years, from 1900; but after reaching a depth of 115, litigation occasioned the cessation of operations. Active development of the New Mine was commenced in 1910, the vein being now developed by a shaft, 160 feet down, while at 150 feet a level has been driven on the ore body.

The granite in which the veins occur is a batholith, covering many square miles to the south of Windsor, with a general trend approximately east and west. The constituents of the granite, which is porphyritic in appearance, are orthoclase (the crystals of which attain a length of from half an inch to an inch), quartz and biotite. The biotite occurs in hexagonal crystals, from $\frac{1}{8}$ to $\frac{1}{4}$ in. diameter; it is readily decomposed and disintergrated by weathering, occasioning blackish-brown stains in the surrounding rock mass. Quartz is less prominent. The granite appears to have been scoured by glacial erosion; and, in places, smooth, level areas are exposed upon which rest boulders of granite and occasionally fragments of metamorphosed sedimentary rocks. The fact that the over-burden is so limited is favourable to prospecting. The presence of manganese is indicated by float, which can be traced to its source. A further indication is the presence of red ochre, which occurs in fissures in the granite, and is known to prospectors as "paint." Wherever "paint" occurs, manganese is likely to be found in depth.

The ore body at New Ross may be regarded as comprising four zones, the first consisting of a gossan (hematite, limonite and goethite), while nearer the surface is a solid mass of iron oxides, which nearer still to the surface becomes floury, changing into red ochre. The thickness of the iron cover ranges from 10 to, perhaps, 15 feet. The second zone (downward), consists prevailingly of pyrolusite and small quantities of manganite. There is a gradual transition from the first to the second zone. Masses of pyrolusite are found in the ochre, the quantity of the former increasing with depth and, in places, filling the entire width of the fissure vein and making sharp lines of contact with the granite wall. On the other hand, elsewhere in the same zone, the entire fissure may be filled with ochre. The ore is very pure and highly oxidizes, consisting, in the upper portion, entirely of pyrolusite, while in the lower portion there is a considerable percentage of manganite. Crystals of pyrolusite, pseudomorpous after manganite, are notably common; in fact, the greater part of the highly oxidized zone consists of a felted mass of these crystals or else prisms protruding from a solid ground mass of pyrolusite. From the same zone a specimen of pyrolusite, pseudomorphous after a carbonate, probably rhodochrosite, was obtained. In the third zone, pyrolusite is less abundant. The ore becomes more massive and harder, assuming a steel blue colour. This ore is composed of manganite and psilomelane, pyrolusite being only occasionally present as crystals in the cavities. Ochre, however, is present as a gouge; or it may fill the entire space between the fissure walls, but it is here less in evidence than in the preceding zone. The fourth zone comprises a hard bluish-brown ore, the main constituents of which are psilomelane, oxide of iron and some manganite.

Analyses show that the degree of oxidation of the manganese is highest near the surface, gradually decreasing as depth is attained. The average manganese content at from 28 to 42 feet was 97.0 per cent., while at from 75 to 90 feet the percentage was 93.9. Thus while the manganese content at these respective depths does not differ markedly, the manganese dioxide, representing the percentage of pyrolusite, decreased 37.20 per cent. within a very short distance from the surface. The percentage of iron, on the other hand, increased. In the New Mine oxidation is evident at greater depth than is the case in the other vein.

Respecting the origin of the ore, Penrose has suggested that the breaking down of minerals carrying manganese contained in the crystalline paleozoic rocks and in igneous rocks, liberates the manganese; and that these rocks are probably the source from which all managanese deposits have been derived. From tests of fresh granite it was found that orthoclase was barren of manganese; but the biotite gave strong reactions for this element. Biotite is the least stable of the minerals constituting the granite; and it appears that manganese and iron, both being equally soluble in water, are taken into solution by meteoric waters, which when freely exposed to the action of air, as would be the case in fissures, precipitate their mineral content which is deposited in the form of oxides or carbonates of managanese. At depths, where no secondary alteration has taken place, the oxide of manganese that was deposited, is, it is suggested psilomelane, and limonite was deposited with it, the two oxides forming a homogeneous mixture. In New Brunswick, where managanese is deposited on pebbles and boulders in creek beds at the present time, there seems to be a preference for the deposition of psilomelane. That carbonates were also deposited at New Ross is shown by the presence of pseudomorphs; and there is even a possibility that the entire deposit was laid down as carbonates (siderite and rhodochrosite), and that these, being unstable, gave up CO_2, leaving a mixture of iron and manganese oxides. This, however, is not probable.

Changes of a secondary nature produced conditions as at present existing. The oxide of manganese being (under certain conditions) more soluble than the iron

oxide went into solution. The iron capping which is barren of manganese is a proof of the greater solubility of the manganese. Psilomelane probably, therefore, went into solution and was re-deposited as the hydrated oxide of manganese, "manganite." A further oxidation and dehydration again produced pyrolusite. Evidence pointing to the derivation of the pyrolusite from psilomelane is that even in the purest pyrolusite there are appreciable quantities of BaO, which psilomelane contains and which it seems remained with the manganese ore through all its secondary stages.

NOVA SCOTIAN BARITE.

(Written for The Canadian Mining Journal.)

The existence of large deposits of barite in the neighbourhood of Lake Ainslie, Cape Breton, has been known for some years. Frequent mention of these deposits has been made in the publications of the Geological Survey, and in the annual report of the Nova Scotian Department of Mines.

At present the two most important properties in the Lake Ainslie region are the Campbell and the McMillan —names that are entirely appropriate to Cape Breton. On both a certain amount of development work has been done, and from both shipments of crude barite have been made to the United States.

Only the Campbell property is being worked at present. It is located near the village of Scotsville and is owned and operated by Barytes, Limited. (It may be mentioned here that we prefer the less archaic variant "barite,") The head office of the company is in Halifax. Mr. S. M. Brookfield, a well-known contractor, is president, and Mr. H. H. Harrison is general manager.)

Barytes Limited Mill

The barite veins, of which there are two, at right angles to each other, are about half a mile from Lake Ainslie and outcrop on the top of a hill 400 feet above the lake. One of these veins has been traced by trenching for a distance of 4,000 feet, and apparently is continuous. It ranges from 6 to 12 feet in width, and is of good quality. Shipments have been extracted by means of open cutting. The other vein is from 10 to 16 feet in width, and dips at about 55 degrees to the southeast. It is from this vein that barite is being mined at present.

A shaft, 8 feet by 12 feet, has been sunk to a depth of 110 feet. It is well timbered, and is equipped with a double skipway and a manway. At the 50-foot level the vein has been drifted on for 50 feet in each direction. Another station has been cut and levels started at the 100-foot level. Drilling is done by hand. A large horse whim (see illustration) is used for hoisting. The whim is home-made.

The skips are operated in balance. They dump into a car which takes the ore to the stock pile. Thence it is conveyed in carts to the mill. This, however, is but a temporary arrangement as a back-balance skipway is under construction between the shaft and the foot of the mill. When this skipway and a gravity tramway to the mill shall have been completed, the ore will go first to storage bins at the foot of the hill, and thence, as needed, by the gravity tramway to the mill.

Railway Loading Pier

Deposit at Shaft Opening

The finished product is carried by the company's steamer six miles across Lake Ainslie to Strathlorne Station on the Inverness Railway for shipment to market.

The company's plant for the production of ground barite has but recently been completed. It consists of a substantial frame building, 115 feet by 52 feet, with power house attached, and is fitted with the necessary machinery for crushing, washing, and grinding the ore.

Milling.

The crude barite is first put through a small Blake crusher, set to one inch. It then passes by gravity through a rotary grinder which reduces it to about 4-mesh. Next it is elevated to a 16-foot log washer. The washed ore is delivered to one or four lead-lined tanks, each 12 feet in diameter and 3 feet deep, where it is subjected to treatment with dilute sulphuric acid. Such impurities as lime, iron, and managanese, which are present in various forms to the extent of 3 to 4 per cent., are thus removed. The quantity of acid used is about 5 to 6 per cent. by weight of the ore treated.

After three or four hours the acid solution is run off and the ore is thoroughly washed in the tank. It is then transferred to steam-heated drying floors. When thoroughly dried it is elevated and passed through four sets of buhr-stones. The stones are 48-inch diameter, top-runners, set in heavy wood husks, and are arranged in batteries of four, driven by gears from a single shaft. The ore is conveyed from set to set through the whole battery by a system of elevators and screw conveyors. The finished product is put up in barrels of from 700 to 800 pounds each. The capacity of the plant is one ton of ground barite per hour.

General.

The quality of the product is higher than that of any such material yet produced in Canada. It is white and free from grit. Analyses show it to contain more than 99 per cent. barium sulphate. Recent tests made in the United States have proved it to be quite equal to the highest grade German barite which for years has been the standard of the world.

The greater part of the output is being disposed of to manufacturers of paints and is being used by large concerns both in Canada and in the United States.

It is the intention of the company to add to the plant until the present capacity is doubled. Moreover, a subsidiary plant will be erected for the production of such commodities is precpitated barium' blance fixe, barium carbonate, barium oxide, lithophone, etc.

It is probable that work will be resumed on the McMillan property. Shipments made from the vein uncovered gave encouraging results.

The Nova Scotian barite industry is undoubtedly susceptible of expansion. But it is one of the branches of mining that needs considerable preliminary expenditure, both to erect plant and to secure market.

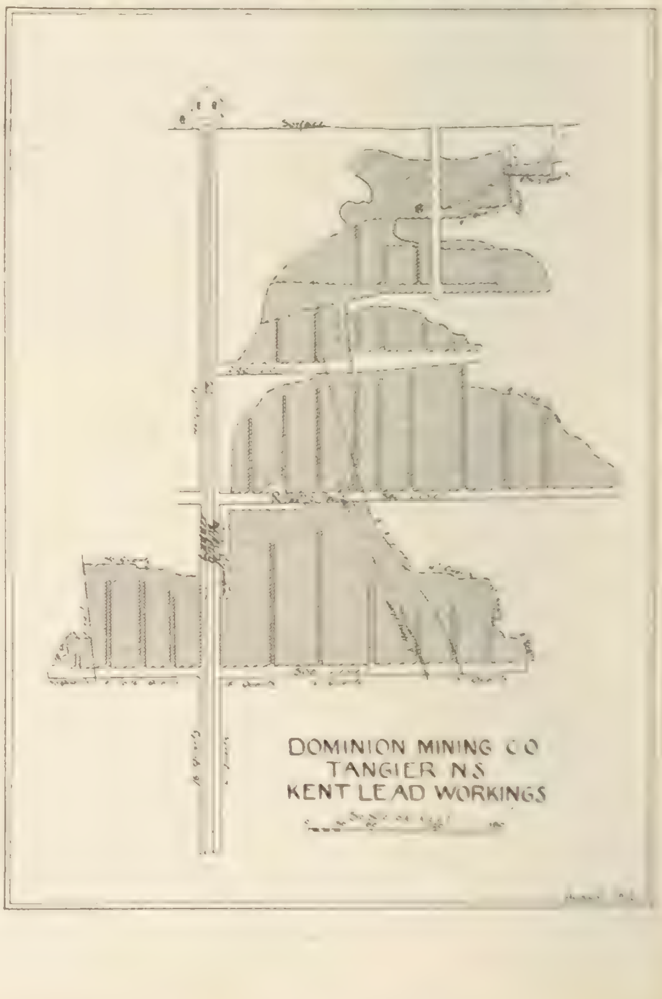
DOMINION MINING COMPANY AT TANGIER. N.S.

The gold district of Tangier in Nova Scotia is one of the three first localities where gold was first discovered in the province about 1860. There has been a good deal of work done in Tangier since its discovery, in the way of small mining companies, tributers and prospectors. The geological structure of this section of the gold-bearing area of Nova Scotia is one of the most symmetrical anticlinal domes in the Province. The axis of the anticline is nearly vertical, the dip of the legs is nearly equal, and the pitch of the nose on one end is almost the same as on the other end of the dome.

There are a number of quartz gold-bearing leads on the areas held by the Dominion Mining Company. Some of these have been worked before by a number of small operators. The leads that are being exploited by the present company are known as the Kent, Murphy Twin and Nigger Leads. The first named lead is the one on which the main shaft has been sunk and in which the principal driving and stoping has been carried on. This lead occurs in a bed of slate and shows a thickness of quartz from 8 to 15 inches. The lead contains a little arsenopyrite, pyrite and galena, but is only sparsely mineralized. The strike of the lead is nearly east and west (magnetic) and the dip about 70 degrees. The plan and elevation of the workings show the general extent and pitch of the ore shoot and also the amount of ore which has been removed.

The Murphy Twin lead consists of two small veins of gold-bearing quartz; one one-half inch thick and the other two inches in thickness. This lead lies about 30 feet south of the Kent lead. The Nigger lead averages 12 inches in thickness.

In order to cut down working costs in the direction of cheaper power, the company developed a nearby water power during the year 1909 and changed from steam to a hydro-electric plant for power. A dam was built across the Tangier River about one mile above the bridge on the Main Post Road. From this dam, the water is conveyed in a flume, 10 by 14 feet, for a distance of 925 feet to the power house. The total head



of water thus developed is 25 feet. Power is developed by two Smith-Morgan, 39-inch turbines working under a head of 18 feet and provided with 7-foot draft tubes. Electric power is generated by means of a 360 k.w., 2,200-volt, 3-phase, 60-cycle generator revolving at a speed of 360 r.p.m. The electric current is transmitted at 220 volts over the line to the shaft house, a distance of about a mile.

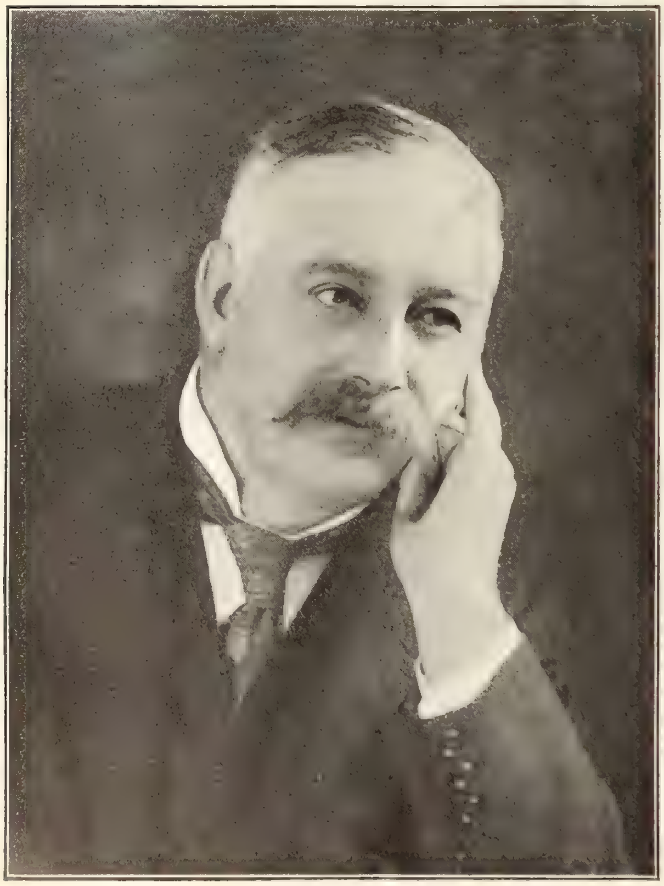
At the shaft house a 150 h.p., 3-phase, 2,200-volt motor drives a class D-2 Ingersoll-Sergeant duplex air compressor with compound air cylinders and vertical intercooler. The capacity of the compressors is 925 cubic feet of free air per minute and it revolves at a speed of 120 r.p.m. A 50-h.p., 3-phase, 2,200-volt motor drives a 30 h.p. double drum hoist manufactured by the Denver Engineering Company. The mill building is situated about one-fourth of a mile east of the shaft and contains 20 stamps. The rock breaker and stamps are driven by a 50 h.p., 3-phase, 2,200-volt motor.

The ore is almost entirely free milling, as is usually the case with Nova Scotia gold ores, and a high extraction is secured by amalgamation in the battery and on the plates so that no concentration or cyanidation is carried out on the mill tailing.

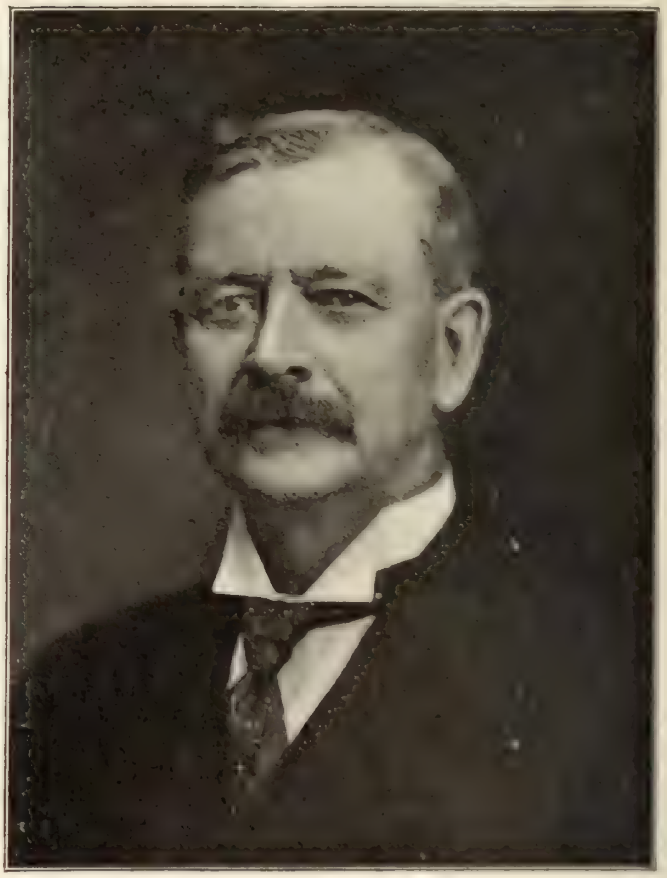
J. H. PLUMMER, President Dominion Steel Corporation.

THOS. CANTLEY
Managing Director N.S.S. & C. Co.

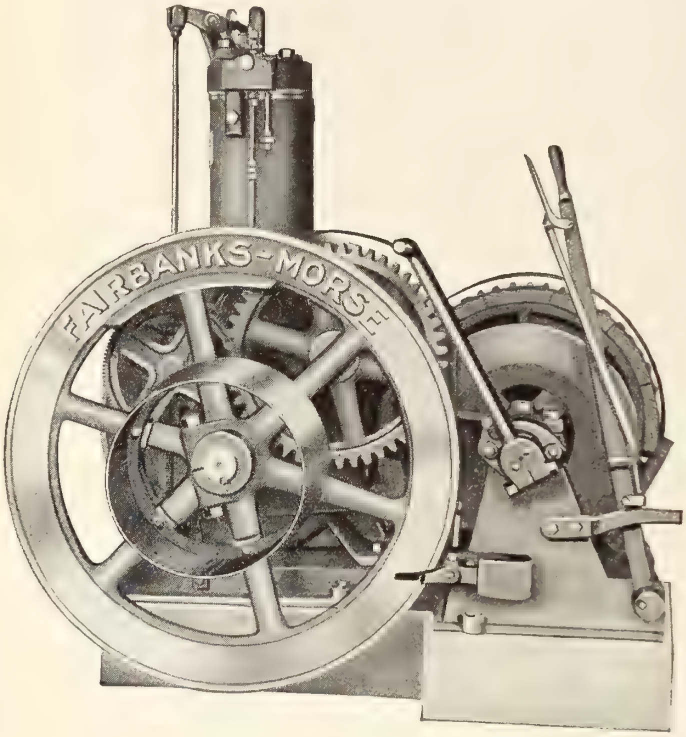
R. E. CHAMBERS
Superintendent of Mines, N.S.S. & C. Co.



R. E. HARRIS
Pres. N. S. Steel & Coal Co.



M. J. BUTLER
General Manager D. S. Corporation



Vertical Geared Hoisting Engine

The Fairbanks-Morse Type "T" Vertical Geared Hoisting Engine shown here is one of the most economical, durable and efficient hoists on the market. This is a 6 H. P., but they are made in sizes from 2 to 12 H. P. They are regularly fitted for gasoline, benzine or naptha, but can be furnished to operate on oil or alcohol.

The drum runs loose on the shaft, while the large gear is keyed fast. A friction clutch mechanism, with conical surfaces, is mounted on the drum, which enables the load to be handled quickly and positively by means of a hand lever. The gearing connecting engine to the hoist drum can be thrown out of mesh, when it is desired to use the engine for other purposes.

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NELSON, B. C.

FERRIER, W. F.
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ENGINEERS, METALLURGISTS AND GEOLOGISTS.

BUYERS AND SELLERS OF METALS

ALPHABETICAL INDEX TO ADVERTISERS

The Canadian Miner's Buying Directory.

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Peacock Bros.
Consolidated Optical So.

Ball Mills—
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Fraser & Chalmers, Ltd.
Canada Foundry.
Peacock Brothers.
Mussens, Limited.

Beams—Steel—
Dominion Bridge Co.
Allis-Chalmers-Bullock.
Mussens, Limited.

Belting—
Jeffrey Mfg. Co.
Canada Foundry Co., Ltd.
Mussens, Limited.
Jones & Glassco.
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Federal Engineering & Supplies, Ltd.

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Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada), Limited.
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Fraser & Chalmers, Ltd.
Mussens, Limited.

Boilers—
Canadian Rand Company Ltd.
Canada Foundry.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Waterous Engine Works Co., Ltd.
Jenckes Machine Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited.
Alex. Fleck.
Peacock Brothers.

Bone Ash—
Lymans, Limited.

Briquetting Machinery—
American Grandal Co.
Mussens, Limited.

Buckets—
Peacock Bros.
Link Belt Co.
Jeffrey Mfg. Co.
M. Beatty & Sons, Ltd.
Waterous Engine Works.
Mussens, Limited.
Jenckes Machine Co.

Building—Steel Frame—
Dominion Bridge Co.
Canada Foundry Co.

Cable—Aerial and Underground—
Fraser & Chalmers, Ltd.

Cableways—
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.
S. Flory Mfg. Co.
Allan, Whyte & Co.
M. Beatty & Sons, Limited.
Mussens, Limited.
Jenckes Machine Co.

Cages—
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Mussens, Limited.

Cables—Wire—
Standard Underground Cable Co. of Canada, Ltd.

Cars—
Jeffrey Mfg. Co.
Canadian Fairbanks Co.
Mussens, Ltd.
Jenckes Machine Co.
Peacock Bros.

Castings—
E. Leonard & Sons.
John McDougall Caledonian Iron Works Co.
Peacock Bros.
Jeffrey Mfg. Co.

Cement Machinery—
Mussens, Limited.
Peacock Bros.
Allis-Chalmers-Bullock.

Cement Testing—
Campbell & Deyell.
Can. Laboratories.

Chain—
Jeffrey Mfg. Co.
Peacock Brothers.
Jones & Glassco.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
B. Greening Wire Co., Ltd.

Chemists—
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Canadian Laboratories.
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Campbell & Deyell.
Thos. Heys & Son.
Milton Hersey Co.
Abalski & Dulieux.
Ledoux & Co.

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Coal—
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Crushers—
Peacock Brothers.
Jeffrey Mfg. Co.

Coal Cutters—
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Mussens, Limited.

Coal Handling Machinery—
Jeffrey Mfg. Co.
M. Beatty & Sons.

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Curtis & Harvey.

Coal Mining Machinery—
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Fraser & Chalmers, Ltd.
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Sullivan Machinery Co.
Canadian Rand Co.

Coal Tipples—
Jeffrey Mfg. Co.

Coal Washeries—
Jeffrey Mfg. Co.
Mussens, Limited.
Peacock Brothers.

Compressors—Air—
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works.
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Allis-Chalmers-Bullock Co.
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Fraser & Chalmers, Ltd.
Mussens, Limited.

Conveyors—Belt—
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Jeffrey Mfg. Co.
Jenckes Machine Co .
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

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Peacock Brothers.
Mussens, Limited.
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M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.

Crushers—
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Waterous Engine Co.
Chalmers & Williams.

Cyanide Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.

Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers, Drafting Materials.
John Davis & Sons.
A. L. Berger.
Peacock Bros.

Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.

Dredging Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

Driers—
Jeffrey Mfg. Co.
Mussens, Limited.

Drills, Air and Hammer—
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
McKiernan-Terry Drill Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.

Drill Steel Sharpeners—
Canadian Ingersoll-Rand Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.
Canadian Ingersoll-Rand Co.

Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

Dynamite—
Curtis & Harvey (Canada), Limited.
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Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Jones & Moore Electric Co., Ltd.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

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Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.

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Fraser & Chalmers, Ltd.
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Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

Engines—Haulage—
Fraser & Chalmers, Ltd.
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E. Leonard & Sons.
Jenckes Machine Co.

Engines—Marine—
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Engines—Oil—
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Smart-Turner Machine Co.
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Jenckes Machine Co.
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Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

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Jenckes Machine Co.

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Mussens, Limited.

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Canadian Explosives.
Mussens, Limited.

Gears—
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John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.

Generators—
Allis-Chalmers-Bullock.
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Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

Galvanized Strand—
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

Girders—Steel—
Dominion Bridge Co.

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Jenckes Machine Co., Ltd.
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Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

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Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.

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Mussens, Limited.
Waterous Engine Works.

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Mussens, Limited.
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Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

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Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

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Mussens, Limited.
Fraser & Chalmers, Ltd.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Incandescent—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

Levels and Rules—
C. L. Berger & Co.
John Davis & Sons.
T. Eaton Co.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse

Metal—Bearing—
Canada Metal Co.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Mica Dealers—
Canada Metal Co.
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.

Monel Metal—
Orford Copper Co.

Motors—
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

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Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Packing—
Mussens, Limited.

Perforated Metals—
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

Pipe Fittings—
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

Pneumatic Tools.
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

Producer—Gas—
Mussens, Limited.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

Pulleys, Shaftings and Hangings—
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pumps—Pneumatic—
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
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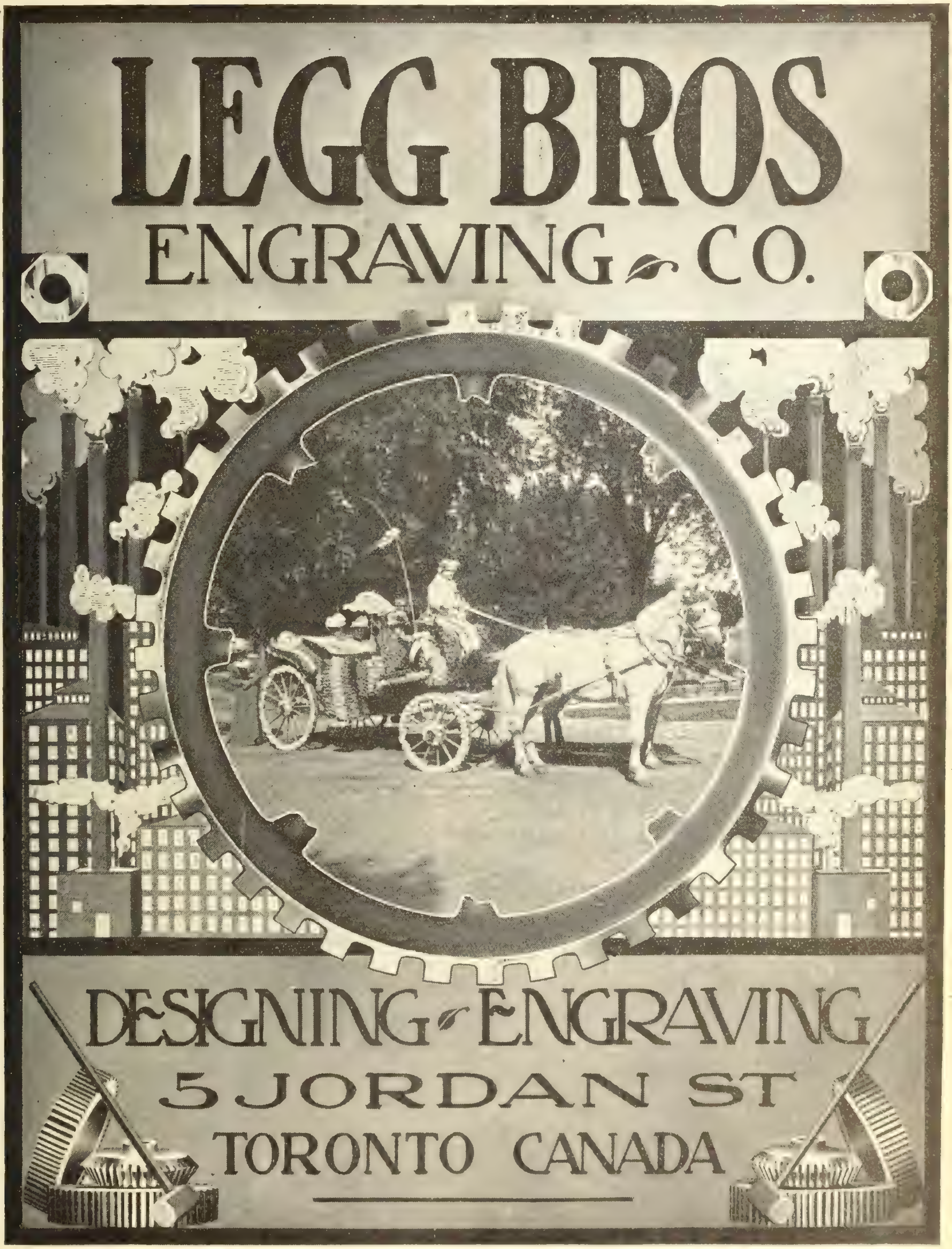
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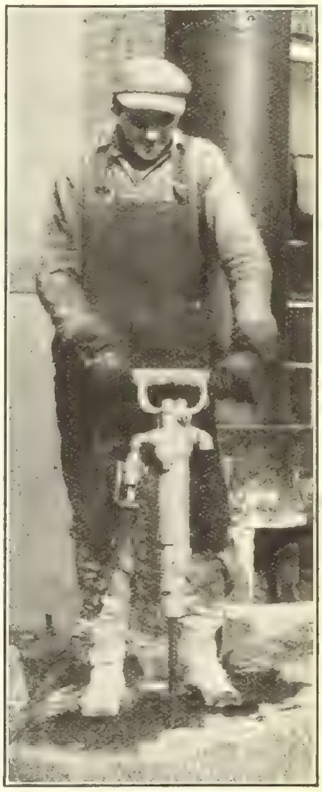

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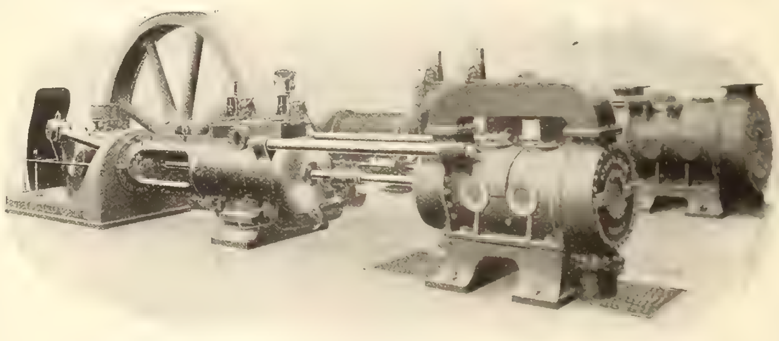

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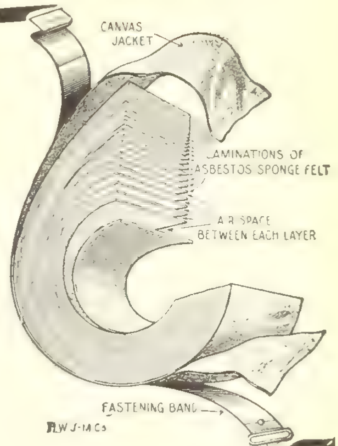

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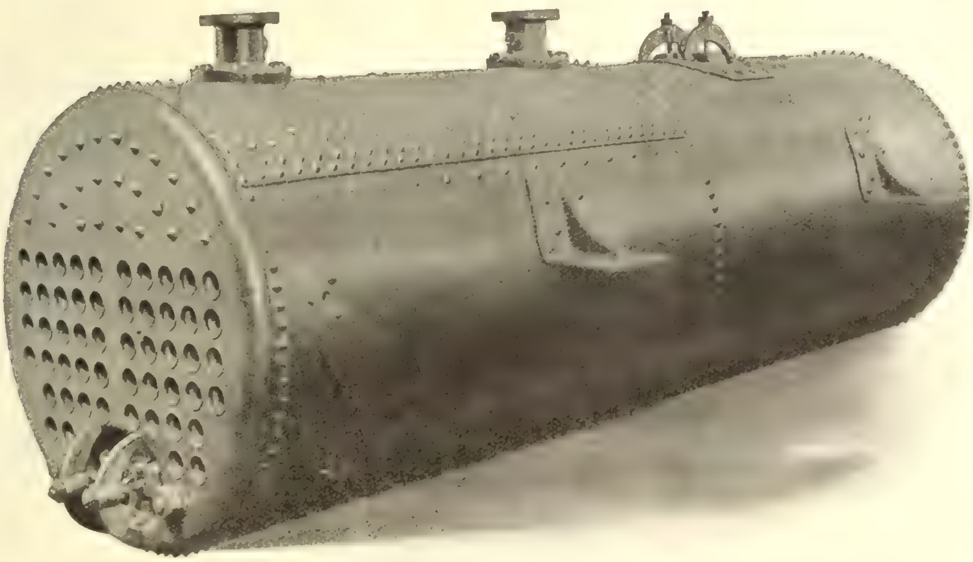

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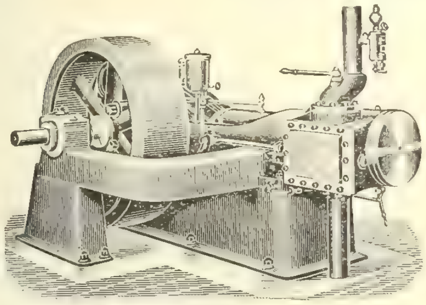

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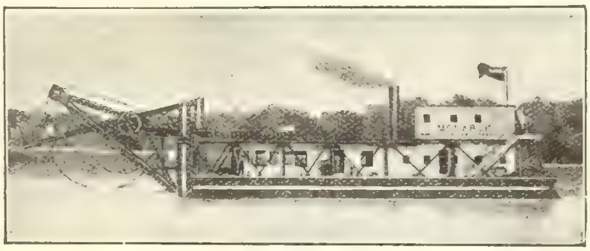

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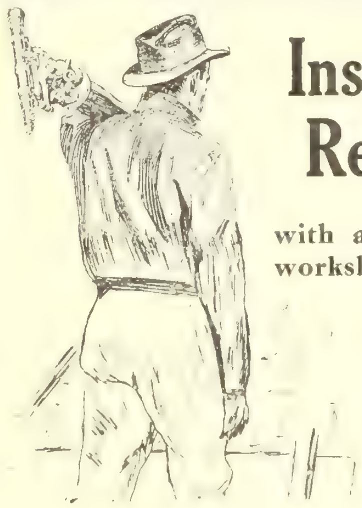

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, October 1, 1912. No. 19

The Canadian Mining Journal

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.

THE EIGHT-HOUR DAY.

The Ontario Government has instructed Mr. Samuel Price, Mining Commissioner, to enquire into the feasibility of establishing by special legislation an eight-hour day in the mines of this Province. To obtain information, Mr. Price is to hold meetings in practically all the mining camps of Ontario. At these meetings all citizens interested will be invited to express their views.

We have before us a copy of a letter sent to Mr. Price by the mine managers of Cobalt. The arguments adduced in this letter are worthy of note. They are all directed against the proposed innovation.

The first point made is to the effect that, at the present rates of wages for a ten-hour day, a reduction of 20 per cent. in the day's pay of all mine workers would result. At present, Cobalt miners are well paid, better, indeed, than in any other mining region of Canada. Unless, then, the rates per hour, which now range from 25 cents to 32½ cents, be correspondingly increased, the miners will lose from 50 cents to 65 cents per day. It would be manifestly unfair, however, for the men to demand the same remuneration for eight hours as they now receive for ten hours.

The second point borne upon by the operators touches the final cost of silver produced. The statement is made that, owing to the cost of prospecting and working unproductive claims, "the final cost of silver is generally above the market value." This is mentioned with a view to offset the fact that many of the mines pay handsome dividends. However, this particular argument is neither exact nor pertinent.

In the third place, the climatic conditions obtaining in Northern Ontario, the heavy marketing expenses incurred in selling silver, the high freight rates charged, and the effect of Mexican competition, are dwelt upon. The marketing cost, per ton of material shipped, is set at $45. This, of course, is a very serious item. Yet the appositeness of these facts may be fairly questioned. It does not appear to us that they bear upon the problem.

The fourth point, however, is thoroughly germane to the matter in hand. The operators now pay the Supplimentary Tax and royalties. They have willingly agreed to bear the cost of workmen's compensation. Cobalt has paid directly into the treasury of the Province, and to the local municipality, a total of $4,328,000. In other words, the interests of the operators must not be overlooked. If the eight-hour day entails loss upon the mine owners, if the change brings a diminution of output, then the mine owners are amply justified in demanding full consideration of their rights.

The fifth clause of the mine managers' letter refers to the "disastrous effect of the Eight-hour Act in Brit-

ish Columbia.'' Here we are at a loss to know just what is meant. If the Cobalt managers attribute all the historic ills incident to mining in British Columbia to the Eight-hour Act, they are quite obviously mistaken.

With the sixth point, namely, that a ten-hour shift underground is not injurious to the miners' health, we are in perfect accord. Under normal conditions the miner's lot is not a hard one. He is well paid, well housed, and extremely well fed. His occupation is not as dangerous as is that of the railway employee, nor are his hours as long. The average loss of time through disability last year was 2.2 days per man. This includes accidents and maladies of all kinds, and, in many instances, the causes arose at the homes. ''The disability directly chargeable to the mines themselves is . . . probably 1.65 days.'' We wonder if any other trade or occupation can make as good a showing as this. It proves, beyond a peradvetnure, that the general working conditions in Cobalt are excellent. The same may be postulated of Copper Cliff, of Porcupine, and of the numerous lesser camps of Ontario.

In the seventh place, the operators urge that where the eight-hour day has been established by law in the Western States, mining is conducted on a large scale, and, underground labour can be so organized as to suffer a minimum loss of time after shot-firing. The Cobalt mines, on the other hand, are too small to permit of the men remaining underground after shot-firing. The average time of actual drilling per shift of ten hours, is 6.45 hours. The remainder of the shift is taken up in getting to and from work, in setting up and taking down the machines, etc. The operators claim that an eight-hour day would reduce the actual drilling time to 4.45 hours, or by 31 per cent., and that, as an inevitable result, outputs and dividends would be similarly reduced.

* * * * * * * * * *

Cobalt is Ontario's most important mining camp. The mine managers are men of reputation. It is not probable that a threatened loss of dividends would induce the managers to retain the ten-hour day if they knew that a shift of this length to be prejudiced to the health of their employees. And, if one fact stands out clearly, it is that Cobalt miners enjoy excellent health. It is also clear that, were serious loss suffered by the mining companies, the miners themselves would be the first and the greatest sufferers.

In principle, the eight-hour day is sound. It has been applied successfully in several countries. It has also been applied unsuccessfully. Special conditions limit its applicability. If it is demonstrated that the special conditions outlined by the mine managers are sufficient cause for the retention of the ten-hour day, the eight-hour day will be a mistake.

In Great Britain, the eight-hour day has been by no means an immitigated success. Many colliery owners have lost heavily in the past year.

The lesson is that the most excellent piece of legislation may have the most poisonous sting in its tail.

THE DISTRICT OF PATRICIA.

By an Act of the Canadian Parliament, there was added to the Province of Ontario in 1912 a district larger than the British Isles. The district of Patricia is the name chosen for this region, which covers the enormous extent of 157.400 square miles. It is bounded northwest and west by Manitoba, south and southeast by the English and Albany Rivers, and east and north by James Bay and Hudson Bay. This provides Ontario with a stretch of 600 miles of seashore, extending northwest from Hannah Bay to the mouth of Black Duck River. In addition to this, a strip of land, five miles in width, is being selected now by Mr. J. B. Tyrrell, who acts on behalf of the Ontario Government. This strip will connect the district with the mouth of the Nelson River, and is to be within 50 miles of the coast. In all, 10 miles of water frontage have been secured along the south bank of the Nelson, thus providing amply for harbour facilities and railway terminals.

The Ontario Bureau of Mines has just issued as Part II. of its 1912 Report, a volume of over two hundred pages dealing with the District of Patricia. Dr. W. G. Miller, under whose direction the volume was compiled, contributes an instructive introduction in which are sketched the general character of the country, the geology, soil and climate, forests, fish and game, water powers, and harbours.

The new addition to Ontario's limits is, in Dr. Miller's words, ''in general much like that of the older northern districts of the Provinces. . . . In elevation, the presence of numerous watercourses and lakes, character of rocks, and, over a part of the district, the nature of the vegetation, it differs but little from the older disricts.''

As to geological character, although little work has been done, Patricia is known to present features similar to the region known as Northern Ontario. ''The greater part of the district,'' says Dr. Miller, ''is underlain by rocks of pre-Cambrian age. . . . In so far as can be judged, . . . the district should contain important mineral deposits.''

Although the agricultural possibilities of the new district may not be of immediate importance, yet it is worthy of note that much cultivatable land is known. At Trout Lake, the Severn River, for instance, ''good crops of peas, potatoes, and other roots'' are raised yearly. The Hudson Bay officer in charge of this post reports that there is rarely any danger of frost. To the west of the Severn, the country is thought to be even more fertile. On the southern boundary of the district, in the region surrounding Lake St. Joseph, heavy crops of hay are grown, and it is reported that pumpkins and muskmelons have frequently been ripened. Hence it is apparent that the climate is at least as temperate as that of old Northern Ontario.

The timber, both south and north, appears to be of small average growth. Much of the district, however,

s well covered. Banksian pine, poplar, birch, spruce, and white and red pine are abundant. White cedar, various kinds of maple, elm, balsam, tamarac, and ash have been observed. The greater proportion of these woods are probably of insufficientdiameter for timber. The forests will, however, become large producers of pulpwood.

Fish and game are plentiful. Whitefish and sturgeon are found in most of the lakes. Dore and pike are also common; brook and lake trout less so. The moose is hunted only to the south, but the caribou ranges through the whole district. Fur-bearing animals are abundant, particularly the rabbit.

Water powers are numerous. According to Mr. W. McInnes, of the Geological Survey, they are for the most part situated far inland.

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Even from these brief notes it will be seen that the District of Patricia holds promise of rich natural resources. It is important, of course, that Ontario should have access to tidewater on Hudson Bay. But it is satisfying to believe that the newly acquired territory will in itself amply repay the construction of railways and the establishment of other means of communication.

Dr. Miller's volume is most timely. It should be given a much wider distribution than is usual with other Government reports.

MINERAL WASTES.

The United States Bureau of Mines is making a determined effort to check the constant and costly waste of mineral substances. In a recent pamphlet there are many strong statements.

For all the coal mined in the United States, at least half as much is left in the mine in such condition that it will be totally lost. The reckless waste of natural gas is another important item, as is also the fact that from 10 to 50 per cent. of many metalliferous and non-metalliferous minerals are wasted or lost.

Particular emphasis is laid upon the wasteful use of coal in all the industries, and the importance of utilizing water powers is accentuated. Dr. Parker's estimate of $40,000,000 as the value of recoverable products wasted in making coke in beehive ovens, gives point to this phase.

Although the metallurgy of iron is much more highly developed than that of any other metal, yet there is much room for improvement even here. The losses in the smelting of zinc run to many thousands of tons daily. The loss of lead in mining is placed at 10 to 20 per cent.; in concentration, 15 per cent., and in smelting, 15 to 20 per cent. And so on, through a discouragingly long list of minerals, ores, and mineral products.

EDITORIAL NOTES.

Twenty to twenty-five mines have been opened in Cobalt during the past twelve months. Leasing is becoming a vital feature of the camp.

Not only are the Foster-Cobalt and other moribund mines being re-opened, but the Waldman, which was thought to have been dead and buried, is to be galvanized into life.

Mr. A. W. Scott, by his familiars yclept "Lucky," has returned from Baffin's Land to Sydney with spikneard and precious ointments and furs, but with no gold to speak of. Also, he effected a gallant rescue of Captain Munn, who otherwise would have remained in cold storage until the last trump.

PERSONAL AND GENERAL

Dr. J. MacIntosh Bell is in Toronto.

The American Mining Congress will hold its fifteenth annual convention during the week, November 25 to 30. Spokane, Washington, will be the place of meeting this year.

Mr. A. D. Miles has severed his connection with the Canadian Mining and Exploration Company and has accepted a post with the Canadian Copper Company. His headquarters will henceforth be at Copper Cliff and Sudbury.

Mr. B. Browitt has resigned from the position of mine manager for the Diamond Vale Collieries, Ltd., operating a coal mine in Nicola Valley district, B.C. He has since been fined for a breach of the law relating to the regulation of coal mining, the Chief Inspector of Mines having prosecuted him, under instructions from the Government.

Mr. A. J. Becker, superintendent for the Lucky Jim Zinc Mines, Ltd., has resumed shipment of zinc ore from the Lucky Jim mine, Slocan district, B.C., after an interruption in output of two years, caused by the destruction by forest fire in July, 1910, of several miles of the Kaslo & Slocan railway, which damage was not repaired.

Mr. W. Blakemore, M.E., of Victoria, B.C., has been appointed by the Provincial Government a Commission to enquire into conditions existing in Doukhobor communities in British Columbia where, it is stated, the requirements of the laws of the country are not being observed by the Doukhobors.

Mr. J. W. Bryant returned to British Columbia a few weeks ago after having made but a brief stay in England. He has since paid a hurried visit to Alaska, and is expected to ere long again proceed to England on mining business.

Mr. Jas. Buchanan, superintendent of the big smelting works at Trail, B.C., owned and operated by the Consolidated Mining and Smelting Company, of Canada, Limited, has contributed a paper, on that company's copper smelting department, for reading and

discussion at the forthcoming semi-annual meeting of the Canadian Mining Institute to be held at Victoria, B.C., on 18th and 19th inst. Mr. W. L. Bell, superintendent of the British Columbia Copper Company's smeltery at Greenwood, Boundary district(is also a contributor, his paper similarly giving interesting information, relative to the works of which he is in charge.

Mr. E. E. Chipman, gold commissioner for Ainsworth and Slocan, British Columbia, is spending a three months' holiday in Eastern Canada.

Mr. C. H. Clapp, of the Geological Survey of Canada, has been investigating the geology of Graham Island of the Queen Charlotte group, British Columbia, on which island prospecting for coal and oil is in progress.

Mr. J. H. Cunningham, for about two years resident engineer at the Extension colliery of the Canadian Collieries (Dunsmuir), Limited, has succeeded Mr. Thomas Russell as superintendent of that colliery. Mr. Cunningham graduated from Acadia College, Nova Scotia, in 1904; spent several years in Great Britain studying colliery methods; retured to Canada and was for a time connected with the management of coal mines in Alberta and Saskatchewan, respectively, and went thence to Vancouver Island, B.C., in 1910. Mr. Russell was the recipient of a handsome presentation gift on his retirement from charge of Extension colliery, as also was he some years ago when he resigned the management of the collieries at and near Nanaimo now operated by the Western Fuel Company.

Mr. A. W. Davis, one of the mining engineers on the staff of the Consolidated Mining and Smelting Company of Canada, Limited, has returned to headquarters at Trail, after having spent some time examining mining properties in the Skeena and other districts now being opened by railway and road communication in parts of the province that have not had much development work done in them in past years.

Mr. Geo. Watkin Evans, of Seattle, Washington, formerly on the Geological Survey staff in Washington State, and latterly engaged in investigating the coal resources of certain properties in the Upper Skeena country, British Columbia, has been chosen as one of a large party by Dr. Joseph A. Holmes, director of the United States Bureau of Mines, is taking to Alaska, to examine one of the coal fields in that part of United States territory.

Mr. W. E. Finch, who has had many years' experience in mining in the Coeur d'Aleno district, Idaho, and other parts of the United States, is now engaged in developing several mining propetries in the Slocan district of British Columbia, to which he and his associate capitalists are now giving their attention.

Mr. James Gray, who after having been manager of the Nicola Valley Coal and Coke Company's Midlesboro colliery, and later of mines of the Union colliery, Vancouver Island, British Columbia, went to Australia, has been appointed manager of the North Bulli colliery, situated 38 miles south of Sydney, New South Wales, where the output has been about 1,400 tons of coal a day, with preparations being made for an increase to 2,000 tons daily.

Mr. W. H. Trewartha-James, who toward the end of last year resigned as general manager of the Tyee Copper Company, Limited, Victoria, and went to England, at the end of July, left the latter country on a professional trip to Nigeria, Africa.

Messrs. R. G. Edwards Leckie, John E. Leckie, and Guy H. Kirkpatrick, returned to Vancouver last month from a trip to mining properties in Portland Canal district, British Columbia.

Col. N. E. Linsley, of Spokane, Washington, has been examining mineral claims in Similkameen district of British Columbia, which an enterprising publicity agency of that city alleges were lately discovered by Spokane men.

Mr. Lockhart, who came from Pittsburgh, Pennsylvania, has succeeded Mr. John Gibson, Jr., as superintendent of the Union colliery of the Canadian Collieries (Dunsmuir) Limited, which colliery is situated in Comox district of Vancouver Island, B.C.

Mr. R. G. McConnell, of the Geological Survey of Canada, recently proceeded to Texada Island, B.C., to continue geological work he did there some time ago.

Mr. J. H. McMillan, at one time mine manager at the Royal colliery, near Lethbridge, Alberta, and afterward employed in one of the coal mines in Nicola Valley, B.C., is now manager of Nos. 5 and 6 mines of the Union Colliery, Cumberland, B.C.

Mr. Richard Marsh, for years engaged in assaying and chemistry work in Rossland and other mining camps in British Columbia and Washington, is now actively connected with gold-silver mines in Republic camp, Washington, distant from Grand Forks, in Boundary district of British Columbia, about 35 miles.

Mr. Edward C. Musgrave, during whose superintendency of the Tyee gold-copper mine, at Mt. Sicker, Vancouver Island, the Tyee Copper Company made large profits, is spending a month or two visiting friends in Victoria, B.C., having come up from Mexico while mining is interrupted by fighting troubles in that country.

Mr. Thos. G. Proctor, of Victoria, for many years resident at Nelson, West Kootenay, B. C., is now managing director of the Lucky Jim Zinc Mines, Ltd., operating the Lucky Jim zinc mine in Slocan district.

Mr. M. E. Purcell, superintendent of the Centre Star-Le Roi group of mines in Rossland camp, is about again after having been in the local hospital for a week suffering with a bad knee.

Mr. John L. Retallack, mine manager, of Kaslo, B.C., has returned from a trip up the old Cariboo road. He and his associates are operating one of the Whitewater group of mines, and preparing to ship ore when railway transportation facilities shall again be available.

Mr. Wm. Fleet Robertson, provincial mineralogist, is expected to return to Victoria, B.C., toward the end of September, after having spent the summer in the Upper Skeena country making investigations in the Groundhog coal basin and other parts of the district.

Mr. Thos. R. Stockett, manager of the Western Fuel Company, of San Francisco, late in August entertained at Nanaimo the "Flying Legion," which included numerous prominent men from various parts of California, who were on a visit to Vancouver Island.

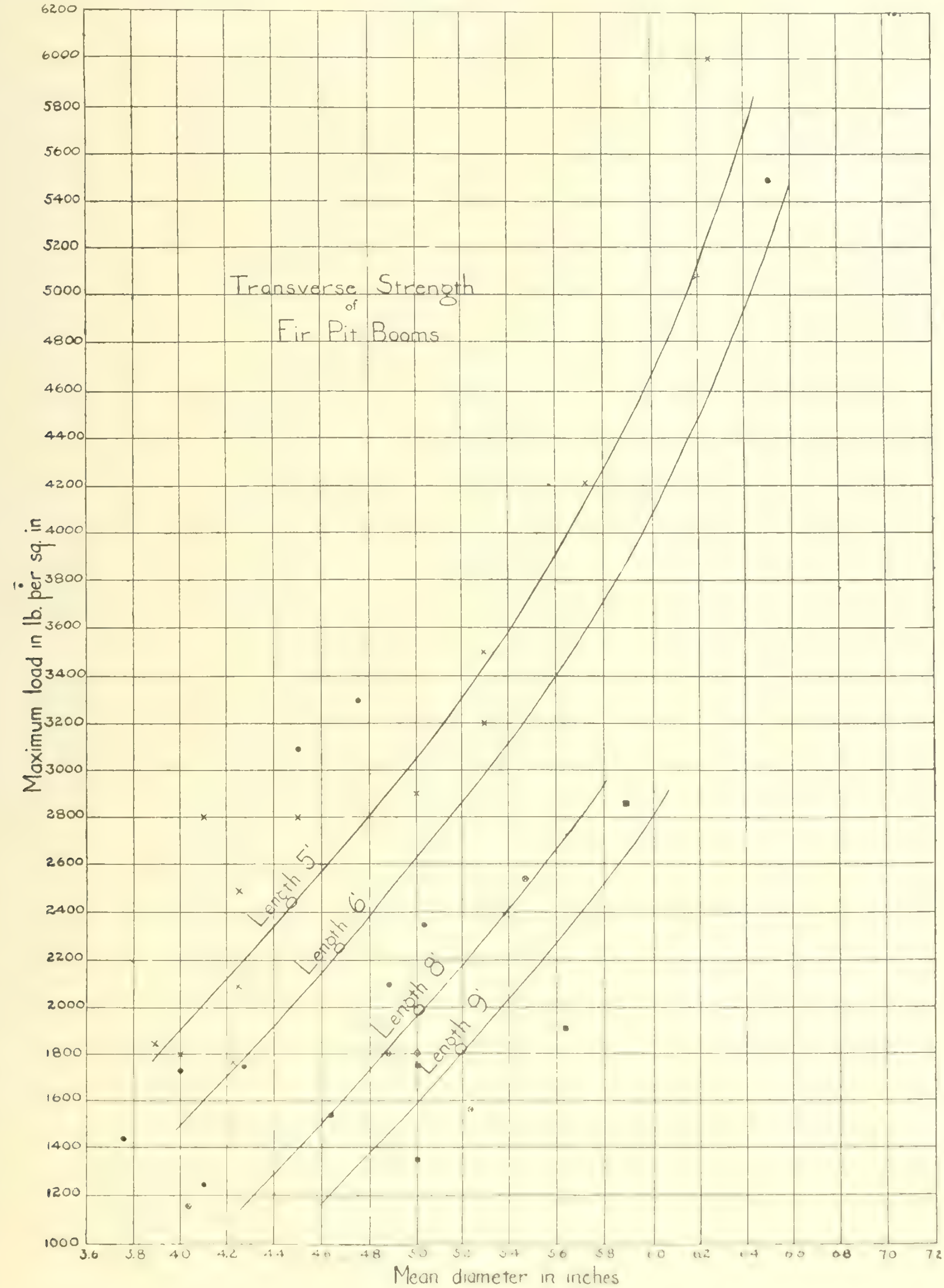
Prof. Francis A. Thomson, head of the mining engineering department of the Washington State College, Pullman, Washington, has been spending several weeks with his parents in Victoria, B.C.

Mr. J. M. Turnbull, of Trail, B.C., mining engineer, on the engineering staff of the Consolidated Mining and Smelting Company of Canada, Limited, is one of the recently chosen fifteen members of the first Senate of the University of British Columbia, steps toward founding which, in the election of a Chancellor and Senate, were taken at Victoria on August 21. John Moncrieff Turnbull, B.A., Sc., graduated with first rank honours in Natural Science at McGill University, Montreal, in 1897. For several years he has been engaged in mining engineering for the Consolidated company, in which connection he is well known in British Columbia, particularly in West Kootenay District.

TESTS ON SOME SPECIES OF N.S. MINE TIMBER.

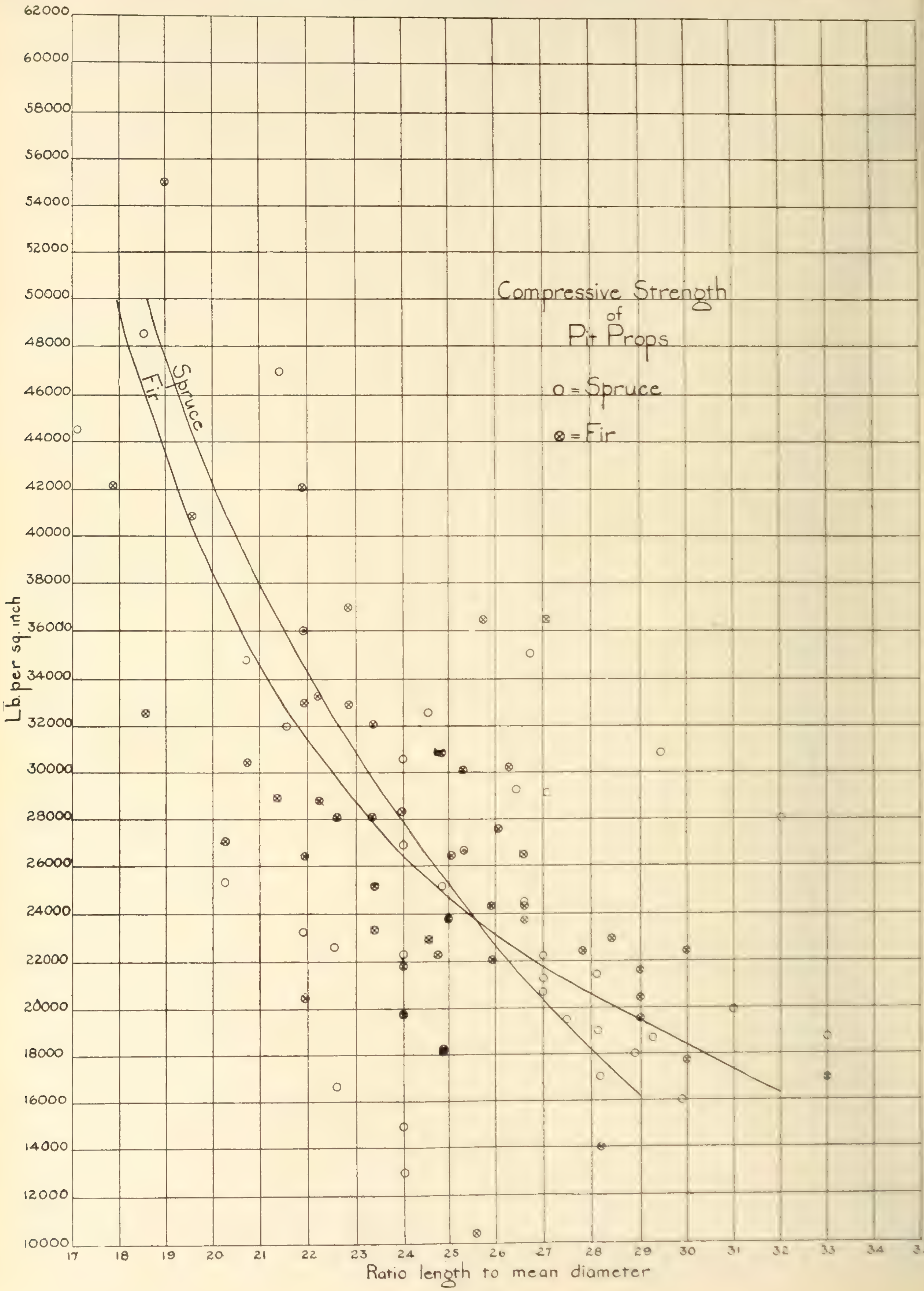
Written for the Canadian Mining Journal by F. H. Sexton and C. A. Hodge.

It is on extremely rare occasions that the mine manager or superintendent refers to an engineer's handbook to find out the strength of timber. Even when building surface structures such as headframes, bankheads, etc., the tendency is usually to follow the dictates of judgment and experience rather than calculations of stresses and the accepted strength of materials found in all the engineering handbooks.



Generally the former course is justified because of the extreme difficulty of determining the actual stresses encountered in such structures in practice, and also because of the necessity of using local material for the strength of which there are few reliable figures.

In using timber underground there would be little practical value to the mine manager in knowing its strength as far as calculating the amount that is neces-


Compressive Strength
of
Pit Props
o = Spruce
⊗ = Fir
Spruce
Fir
Lb. per sq. inch
62000
60000
58000
56000
54000
52000
50000
48000
46000
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Ratio length to mean diameter

sary to keep any excavation supported. The great trouble in such a case is the uncertainty of the exact magnitude of the underground stresses to be resisted. Every miner knows that it takes a much smaller amount of timber to keep a roof from starting than to support it after it has begun to move.

There is a definite practical value, however, in a series of careful tests on mine timbers of the different kinds of wood available in Nova Scotia in showing the comparative value of such materials in relation to their cost. A series of tests on the strength of pit props and booms (*) was started at the Nova Scotia Technical College in July, 1911. The testing was carried out in the Engineering Laboratory on the 50 T. Olsen machine by Mr. C. A. Hodge, Instructor in Mechanical and Electrical Engineering. The timbers were purchased in the open market. They were cut in December and were stacked in the open as soon as they were received. The pieces were, therefore, about seven months old when tested.

The ordinary practice with the coal mining companies is to stack the props and booms in the yard as they are delivered and to use them indiscriminately as exigencies require. It often happens that the timber taken into the mine has been seasoned, but a comparatively short time. This is not always a disadvantage, because the green timber shows a very marked bending without breaking when subjected to extreme pressure at the working face and thus gives a timely warning.

Only a portion of the shipment of this lot of timber was tested; the remainder being left out of doors to season for another year. The results of the tests on the remainder of the timber will be given in a subsequent paper.

It will be noted that the predominating number of props tested are fir. The larger part of the timber furnished to the mining companies is of a similar nature. A few years ago the specifications of one company for pit timber stipulated that 75% should be spruce. Today only 25% spruce is demanded, because fir is much more easily obtained in the sizes demanded for props and booms. The low prices prevailing for this material does not stimulate the vendors to go far afield for a large percentage of spruce.

The props were placed in the testing machine with a cap of spruce plank 10 inches x 2 feet in order to test it under as nearly the same conditions as they are used underground as possible. The props were also placed in the machine just as they were delivered from the vendor and no steps were taken to be sure that the ends had been sawed across perfectly parallel. It was thought best to put them into the machine and submit them to pressure under conditions as nearly as possible like those existing in a mine.

The results of the tests are given in the form of tables showing the details of each specimen. The general results are summarized in the curves. It should be mentioned the maximum load on both props and booms is the only one to which any attention should be paid. After the prop or boom had deformed under the maximum load the stress dropped very considerably and the stress necessary for complete failure of the piece of timber was very much less—sometimes only 1/10 of the maximum load. This was due to the fact that the deformation produced by the maximum load was enough to break a few fibres. but the rest of the fibres were so flexible that the piece would suffer considerable subsequent deformation under a smaller total stress before a complete failure.

The first diagram shows a comparison between spruce and fir as props. These results point to the fact that, in the case of props which have been cut seven months, spruce is superior to fir in compressive strength in short lengths up to the point where the ratio of the length to the mean radius is 25.5. Beyond this point in greater lengths, the fir is superior to spruce in compressive strength.

In the tests on pit booms, only the results obtained in the case of fir are plotted, because there were too few specimens of spruce to warrant any definite conclusions.

The fir seems to give the more consistent values throughout and specimens of the same size do not vary as widely as do those of spruce, although the values in both cases lie at some distance on both sides of the average curves.

As intimated earlier in the paper, the rest of the lot of mine timbers will be tested during the summer of 1912. It is hoped that the results of the series will be of some practical value to the mining industry of the Province, where the timber supply problem is growing more acute each year.

CONSERVATION OF NOVA SCOTIAN COAL FIELDS.

By Neil A. Nicholson, Deputy Mine Inspector, Sydney Mines, N.S.

In the absence of statistics showing the percentage of coal won from the coal-fields of Nova Scotia since mining became a recognized industry, I shall have to submit opinions based upon observation during a period of forty years spent in the collieries of our province. Whether these opinions will meet with the approval or disapproval of the members of this society gives me little concern. That the question of conservation of the coal-fields of Nova Scotia be brought before you is my chief object, for wrapped up in this question is that of the economic mining of coal on sane and safe methods.

Unfortunately no attempt was made in the early years of mining, in this province to collect information showing the amount of coal won and wasted. It did not then occur to mining men and mine departments that tabulated figures along this line were a necessary part of the business and would prove very valuable information when the season of stock-taking came around and we desired to know how our coal areas were turning out. The different governments seemed satisfied with the reports of the inspectors or deputy-inspectors, whose duties it was to see that the coal properties were utilized to the best advantage. A few years ago, the Mines Department at Halifax introduced a system of gathering such information, and it is now in a fair position to state how much coal is being extracted and how much is being left in the mine. The period of time over which this date extends is too limited to enable me to give any definite statement in the way of figures and I prefer on this occasion to use the knowledge I have gained during my experience of

* "Prop" is the term generally used in the Nova Scotia Coal Mines to designate upright timber supports used either singly or in timber sets. "Boom" is used to designate timber supports placed horizontally either by itself with the ends resting in hitches or as the upper horizontal member of a timber set.

some years, both as a miner and inspector of mines, upon which to base my observations and conclusions.

There is no clamour in this province to conserve our coal areas; indeed, at present it is all the other way. The great desire of the people is toward the rapid development of these areas. At times criticism has been made of the extent of the coal properties held by the larger companies, and some seemingly good advice tendered by men wise in thei rway, who, in their zeal for the common good would multiply collieries until every coal seam was attacked, with the result that a few years would find us despoiled of the basic commodity of all our industries—left at the commercial mercy of an alien and competitive nation. To the warnings of these carping critics, the public has hitherto paid but little attention, as they somehow feel that in the hands of hard-headed Canadian men of business there is no danger, immediate or otherwise, of unnecessary waste of our coal. Nor is it in the best interests of either the public or the mining industry that coal seams beyond those necessary to supply the demand should be opened. For many years it was generally thought that the more collieries there were, the better it would be for the coal industry. The public still holds the same view; but while it may be to the advantage of consumers that coal be abundant and prices low, it works out very badly for the miner in the way of idle time because of over-stocked markets. A concrete illustration of this may be found in the mining conditions of the United States. The coal output of that country last year was 500,000,000 tons, yet the statement is made by American labour leaders that many of the collieries only worked one hundred and sixty-two days out of the year. In other words, the American collieries worked less than half time during the year, yet they supplied the full demand of the market. Look at this another way; if half the collieries were closed up and half of the miners put to some other kind of employment, the remaining collieries and miners working steadily would more than supply the demand for coal. Surely the opening up of unnecessary coal seams, the equipment of collieries and the manning of them with labour is a useless waste of money and men, and has its inevitable result in labour unrest. All ill-balanced industrial conditions seriously affect the peace of a nation. The great danger to the public interest lies in listening to the utterance of untrained, unpractical enthusiasts upon whose vision has suddenly dawned the importance of any industry of which they conceive themselves to be the guiding spirits or the guardians. Such men are more ideal than real, and fail to see that technical skill combined with sound judgment and good practical business methods are incomparably superior to all fine theories in achieving results in any field of labour, especially the coal field. Nova Scotia is not without her quota of these visionaries.

Conservation, as I understand it, is the right use of any commodity for present need, or as another writer has put it, "conservation of any commodity or power is a maximum efficiency with a minimum waste." It conserves what it does not need now for another day; it has thought of the morrow, while to-day it uses to the full for its own necessity. How far the principles of conservation were appiled in the early mining days cannot now be fully ascertained. That they are at present being applied with all the aid of well-directed scientific knowledge, there can be but little question. The large coal companies of this province and the government in their desire to intelligently deal with the problems of the coal industry, have diligently sought and obtained expert advice from the foremost mining engineers of Britain. They recognize the necessity of having trained and practical men with large experience give their opinion on our coal-basins and the strata in which our coal is imbedded. The single purpose for such outside aid is the strong desire to make the most of the mineral wealth of our province for the good of all interested. But before dealing with the work of our large coal companies and their methods of mining, it might be to the benefit of all were we to look for a moment at the causes which brought large coal companies into existence in the country of our neighbour across the border.

The evolutionary period of the coal industry of the United States forms an interesting chapter in the industrial history of that country and is well worth consulting. The baneful waste of coal and the destruction of valuable coal beds, early attracted the attention of American mining engineers and compelled them to study the causes leading up to such waste. Through the writings of these men, a special commission was appointed by the government to investigate the conditions of mining and the amount of coal won and wasted in the American coal-fields. The report of the commission showed that for every ton of anthracite coal shipped, 1.5 ton was wasted, and while the loss in bituminous mining was not so great, yet large waste was found to exist. Several causes led up to this reckless depletion. Principal among these causes were the short-term leases, payment of royalty only on coal shipped and on the larger sizes of coal. It was found that under the short-term leases, the efforts of the lessee were directed to getting to market as much coal as possible of the most saleable sizes within the given time of his lease. It mattered little to him how much coal was wasted so long as he made profits. The system under which he worked became known as the "hogging" system, and it was found ultimately to work against his own best interests and that of the owner and the public. The recommendation of the Commission led to the formation of strong companies that bought up large coal-fields, in the operation of which sixty per cent. of all anthracite coal was obtained. The bituminous coal-fields showed even better results.

The Province of Nova Scotia has been fortunate in that its coal-fields have been held by the province for the people. No wholesale plundering can occur where there is proper government supervision and where mining legislation gives stability and confidence to investors of capital. Under the twenty years' lease with the right to renew, there is little incentive to fevered haste to rob and ruin valuable coal-seams, and more care is exercised in gaining a horough knowledge of the condition of coal in its occurrence, before the method best adapted to its extraction is determined. The extension of the leases for a further period contains the very essence of conservation, in that it gives still greater confidence to capital and permits of larger companies which can lay out their plans on a scale calculated to obtain the best results. But before these large companies were formed, many costly mistakes were made by the early mining companies. Some of these companies were of very limited capital and quick returns had to be extracted from coal mining. For this purpose pillars that should have been left to support the surface and underground workings were drawn, with the result that every drop of rain that has fallen during the last thirty years over the areas of these districts had added to the cost of mining coal. Mistakes of this nature, however, do not lead to waste of coal; they

have the opposite effect and eventually react on the operators themselves in the way of increased cost of production. But it is not good mining and shows a lack of sound judgment on the part of mining men who permit the drawing of pillars that should be left standing. Added to these mistakes were the early accidents that occurred, such as explosions and mine fires, causing the abandonment of sections of the mine and, in more than one case, of the whole mine. With the result of these mistakes and accidents the present companies have to contend; and, added to the difficulties of mining which Nature has thrown in, they form very serious problems indeed.

The coal-fields of Nova Scotia contain many beds of good quality, ranging from one to forty feet in thickness. Mining is yet only in its infancy and hundreds of millions of tons of coal lie awaiting the pick of the miner. Many of the coal-beds are easy of access, and with proper care and skill ought to be economically and profitably mined. Other beds are beset with many difficulties and present many serious problems. These problems vary with the coal-fields and are becoming more complex with the age of the industry. Much of the coal lies at a very heavy spool angle and dips deep into the bowels of the earth; in fact, the deepest coal mine on the American continent is to be found in the Pictou coal-field. Other beds lie under the Atlantic Ocean, in which case the thickness and nature of the intervening strata between the coal and the ocean-bed means much. This is amply illustrated in the recent accident to the Port Hood and Mabou mines. Other beds again are contorted and very irregular in their formation, while some are thick—too thick—and some very thin. Even our most extensive coal areas which lie at easy angles and are of medium thickness and of splendid quality are nearly all found dipping under the sea, and the great bulk of coal mined from these in the Island of Cape Breton will at no distant day be drawn from under the bed of the ocean. Upon the method of working these beds depends largely the amount of coal taken out. It is known to you that the best results are obtained from beds ranging from four to eight or nine feet in thickness. Beds less than four feet thick are costly to mine and do not yield good results in the way of profit, as they come into competition in the market with coal from thicker beds. The government has not lost sight of these beds, however, and care is being exercised in the working of the larger to preserve the thinner ones, which at some time in the future will be of greater commercial value. Two of the largest producing companies are mining coal in their thick and thin beds and in this way are gaining experience which will be useful when a general attack is made on the smaller seams. But it is only the larger companies that in the present state of competition can experiment in this way, and while not wishing to be misunderstood in my attitude towards any coal company operating in the province, I am of the firm belief that it is in the best interests of the public that our largest coal-fields should be in the hands of strong financial concerns interested and allied with other indutsries, such as railways, the manufacture of steel and iron products, shipping, etc. In such cases coal is made the basis of a profitable business and coal operators have other aims than the rapid spoliation and the depletion of coal beds. For these and other apparent erasons, a sane and safe policy will always be pursued by the different companies of our province.

In nearly all parts of the province, the initial work of mining requires a large expenditure of money if results are to be obtained. Shafts have to be sunk and slopes driven to great depths. Costly machinery must be installed and surface buildings of many kinds constructed. Plans for opening up the mine must be made and the method of mining determined as soon as the underground conditions are known. This work can only be done by a competent and practical mining man, for mining is an expert question upon which competent men only can advise. The larger the expenditure, the greater the need there is for the best talent. Herein probably lies the greatest safeguard against ruinous mining methods and the surest road to the highest economy in mining, "with a maximum efficiency and a minimum waste." Large interests must be in the hands of large and capable men, and the concerns which are always ready to pay the highest prices for costly colliery equipment are equally ready and able to secure the services of the person best qualified to look after those interests.

Every mining man now knows that a certain amount of coal must be left in the mine to protect the workings. Some of this coal must necessarily be sacrificed, while a portion of it may be recovered in the last stages of mining. Given the true conditions of the coal bed, it is simply a matter of calculation as to the amount to be taken out and to be left, and it is one of the best evidences of engineering skill when this coal that must be sacrificed is determined and deliberately set apart for that purpose at the time when the colliery is opened or very soon after. When a large territory is to be worked, a much larger percentage of coal can be won, if the conditions in which the coal occurs are carefully studied and a general system of working decided upon and carried out from the beginning.

This is generally understood and observed in the mining practice of our province and no departure from the method once adopted is permitted, except in cases where a reasonable cause is given or by way of experiment, in which case the change of method is limited to a certain section or part of a section of the mine. In most of the collieries now working, large sections of coal have been taken out with but very little loss. This is due to following out the method once adopted, with military precision, as no deviation other than for the causes mentioned are permitted, and it is no uncommon thing among miners to hear them state that the section of he mine in which they worked was swept as clean as with a broom. This is a commonplace mining expression and applies to the successful extraction of pillars. It is uttered with more or less pride, both by the miner who digs the coal and the official whose duty it is to see that all coal that can be reached with safety is mined and sent out. The mine may be left empty, full of nothing but fallen rock and debris, but this in its essence is, we should say, true conservation of coal. But the greater the quantity of coal taken out of a given area, the longer the supply will last.

Just a word in closing in reference to the character and ability of the men in whose care are our collieries, the great majority of whom are native-born. With an intelligence and application worthy of a province that has sent men of education and genius into all parts of the world, they have applied themselves to the mining problems of their own coal-fields with a degree of success unequalled and unattained by others working under more favourable conditions. Mining men of skill have been brought in from other countries to add their quota of experience, but all without exception have been outspoken in their praise of the Nova Scotian mine official. These men have come and gone, and have ad-

mitted that from the men engaged in the Nova Scotian mining industry they learned more than they, in turn, were able to impart. This is a tribute of no mean worth and one which enables us to see ourselves as others see us. But we are not satisfied to rest on success attained, there is much to be done and more to be learned and he only is a true citizen who nobly stands by the men who go down deep into the bowels of the earth and with true courage risk all dangers to bring up the treasures of ages, long stored up for the use of mankind.

* * * *

Discussion.

C. Archibald.—The conservation of minerals is a most necessary subject for study; but so far, speaking of Cape Breton more particularly, with one or two exceptions, there has not been very much loss through bad mining. In the first place it is the object of the owner and operator to conserve the mines. It should be their object to have around them men with sufficient ability to look after that part of the work. If the mine is worked badly near the sea and proper precautions not taken to have sufficient timbers, or if the pillars are taken away, the sea water gets in; and many mines are lost in that way. It is possible to get out about 70 or 75 per cent. at first, but anyone familiar with mines knows it is more than an ordinary average. It depends largely upon conditions. Some leave more pillars in, and others risk having falls.

Hon. R. Drummond.—I am sorry I had not seen the paper before. I take exception to certain things. The day of the one-man operator is gone. The time was when the one-man operator did very well, and Mr. Archibald retired with heavy profits. A great deal depends on conditions and a great deal on management. In Cape Breton they are not so unfortunate, but in Cumberland they lost millions of tons owing to mistakes in management. The contractors call on the manager for cheap coal, and in order to get it he draws the pillars; there is a crack, and all coal is lost for the time being, and we thought at one time it was lost for ever. The time is coming when only strong companies should operate. As a rule, with the exception, perhaps, of an isolated company, small collieries will fail.

A vote of thanks was presented to the writer of the paper.

OIL SHALES OF PICTOU COUNTY, N.S.

The oil shale industry of Scotland has attracted wide attention because of its considerable extent and also on account of the large dividends paid by most of the companies engaged in the business. In 1909, there were at lease 10,000 workmen employed in the oil shale industry, to whom were paid nearly $5,000,000 in wages. Four out of the five largest corporations engaged in this line of business paid dividends from 15 to 50 per cent. It is no wonder that the large deposits of oil shales in Nova Scotia and New Brunswick have excited a good deal of interest by people acquainted with the possibilities of this industry. The deposits in Nova Scotia which have been most frequently mentioned have been those of Pictou County, Antigonish County, Lake Ainslie, Cape Breton County, and near Cheverie, Hants County. The present paper deals with those of Pictou County.

Oil shales were first discovered in Nova Scotia in Pictou County in 1859. The discovery consisted of a seam of stellar or oil coal with bituminuus coal and shale lying under the McGregor seam of coal in the Pictou basin. This bed containing the oil coal was five feet thick and made up as follows:—

Bituminous coal	1 ft. 4 in.
Stellar or oil coal	1 ft. 10 in.
Bituminous shale	1 ft. 10 in.

The oil coal when pure was called stellarite because of the fact that when a splinter piece was lighted with a match, it gave off scintillating flame and little star-like sparks.

Sir J. W. Dawson, in his "Acadian Geology," gives his opinion of this coal as follows:—

"The material known as stellar coal is, as I have maintained in previous publications, of the nature of an earthy bitumen, and, geologically, is to be regarded as an underclay or fossil soil, extremely rich in bituminous matter derived from decayed and comminuted vegetable substances. It is, in short, a fossil swamp muck or mud, which, as I have elsewhere pointed out, is a character of the earthy bitumens and highly bituminous shales of the coal formation generally. Its value depends on the high percentage of illuminating gas and of mineral oil, which it yields on distillation, and it is likely on this account to form an important portion of the products of this coal area. According to the results of different trials it is stated to yield from 50 to 126 gallons of crude oil per ton, the larger amount being apparently the yield of the pure stellar coal."

Professor How of King's College analyzed this coal and gave the following results:—

	Pct.
Volatile matter	66.33
Fixed carbon	25.23
Ash..........................	8.21
Moisture	0.23

This sample gave 126 gallons of crude oil per ton

In the Geological Survey report for 1869, Sir W. E. Logan and Edward Hartley report that stellar coal occurs at several places in the Pictou coal field, notably at Marsh Brook, McLellan Brook and Coal Brook, near No. 3 slope.

The stellar coal was worked to some extent and sold principally to oil distillers for making petroleum and to gas works for enriching illuminating gas. The discovery and exploitation of oil resources in the United States shortly after 1860 made the working of the stellar coal and oil shales unprofitable, and the mining of the latter in Nova Scotia has been practically nil up to the present time.

The deposits of stellar coal and oil shales in Pictou County have been often examined by members of the Geological Survey, scientists and engineers. The results of numerous investigations and analyses have been published so that the nature of the oil coals and shales may be fairly ascertained.

Mr. E. Hartley of the Canadian Geological Survey reports of the oil coal found on Marsh Brook and McLellan Brook, is both of the shaly and the curly variety.

the latter kind appearing to be the better quality. The oil coal with a curly appearance resembles stellarite in appearance, but is much heavier and has a lighter brown color. It weathers a dark grey. Some large samples were taken from this locality by Sir W. E. Logan in 1868 and gave the following results on analysis:—

	Per Cent.
Volatile below 200 C. water and some oil..	0.67
Volatile at 200 C. (oil)	14.73
Total vol. matter	33.91
Fixed carbon	6.11
Ash (greyish-brown)	59.88
	99.90
Coke	66.09
Sp. gr.	1.747

On close examination of these shales, Sir William Logan reports as follows:—

"This substance appears to be an argillaceous shale of a greyish black color, having a brownish streak; the bedding is not well marked except on surfaces of fracture, where the lamination can be traced by numerous small brilliant points, apparently bituminous, which are included between the laminae. A thin section of this oil shale under the microscope presents the appearance of a dark-brown or black-ground, nearly opaque, with numerous spots of yellow which are translucent; the black ground being the shale, and the yellow spots the included hydrocarbonaceous matter."

The deposit of stellarite or stellar coal that was previously mentioned in this paper was worked to some extent by Mr. J. D. B. Fraser, and later passed with other holdings to the Acadia Coal Company. Mr. E. Hartley of the Geological Survey describes the three constituents of the bed containing the seam of stellarite as follows:—

"**Coal.**—The coal appears to be merely an ordinary fat coking coal, with an unusually small percentage of ash for this region, but the bench being thin, the value of the seam depends principally on the two lower divisions, stellarite and oil shale.

"**Stellarite.**—This peculiar substance was first known and worked at these mines by the former owner, the late Mr. J. D. B. Frazer, of Pictou. It appears to be an earthy bitumen, or to quote Dr. Dawson, a fossil swamp muck or mud, which has the character of the earthy bitumens and highly bituminous shales of the coal formation generally.

"**Bituminous Shale or Oil Shale.**—This is a rather heavy, brownish-black shale. The following remarks thereon include both this bench and the stellarite. The first series is taken from Mr. Hoyt's report to the Acadia Coal Company for 1866, and the analyses under the head of No. 1 refer to the stellarite, while No. 2 refers to the oil shale."

Analysis by Professor Wallace of Glasgow.

	No. 1.	No. 2.
Vol. matters	68.38	38.69
Fixed carbon	22.32	8.26
Ash	8.90	52.20
Sulphur	0.05	0.25
Moisture	0.32	0.60
	No. 1.	No. 2.
Gravity of oil	0.844	0.850
Crude oil per ton	126 gals.	63 gals.
Sp. gr.	1.079	1.568
Weight per cubic foot	67½ lbs.	97 lbs.
	100.00	100.00

Ash in coke of stellarite—28.48%.

Analysis by Prof. Penny, Andersonian University. Glasgow.

	No. 1.	No. 2.
Vol matters	67.26	34.16
Fixed carbon	24.03	12.30
Ash	8.40	52.00
Water	0.20	0.80
Sulphur.	0.20	0.80
	100.00	100.00
	No. 1.	No. 2.
Sp. gr.	1.069	1.612
Weight per cubic foot	66¾ lbs.	100 lbs.
Crude oil per ton	123 gals.	60¾ gals.
Gravity of oil	0.844	0.850

Several actual tests were carried out on large samples of the same character of material as samples No. 1 and No. 2, and the results are as follows:—

Trials by Mr. J. DeW. Spurr, of St. John,s N.B., of No. 2 crude oil per ton	74 gals.
Trials by J. Haworth, Boston, Mass., by steam process.	65 gals.
Trials by F. McDonald, Portland, Me., No. 2 crude oil	50 gals.

The practical results of the material extracted by Mr. Frazer in working the mine on the bed containing stellarite bed was 60 gallons of crude and from 30 to 35 gallons of fine clarified oil per ton. The size of the seam of stellarite varied from 4 inches to 2 feet in thickness. As a rule the seam appeared to improve toward the eastward of the Frazer slope.

The general appearance of the Stellar coal is peculiar; it is irregularly bedded, the different layers seemingly interlaced, giving it a sort of entangled appearance, or a structure like felt. Sometimes the layers are much curved and have smooth surfaces like slickensides, which appear to have been produced by lateral movements, corresponding very nearly with the plane of the bed, rather than by vertical motion, the better layers generally possessing this peculiarity, whence the statement in many notices of this substance that the curly oil-coal is the best. The surfaces of these curved faces have a bright resinous lustre, and a brown-black colour, while a block sawn across shows a uniform dead-brown surface. It breaks with a splintery fracture, very irregularly, but approximately with the surface of deposition; the streak has a brown colour and a dull resinous lustre.

The stellarite and oil-shale from this bed were used at the gas works in the town of Pictou for enriching the illuminating gas. The general results were as follows:

"The yield of gas from the stellar coal of the Frazer mine was 11,000 cubic feet per ton of 2,240 lbs. of illuminating power of 36 candles; coke worthless. From the oil-shale, 8,000 cubic feet of 36 candle power."

Several attempts have been made to find oil by boring in this part of Pictou County, without any gratifying results. The amount of oil-shale mined and sold from the Frazer slope in Stellarton and Patrick's shaft near McLellan Brook was about 4,000 tons. The average value of this shale was about $8 a ton. A greater part of this product was sent to oil works in the United

States and part of it was used in Nova Scotia for the enrichment of the gas manufactured from bituminous coal.

The most complete map of this district was compiled by Mr. H. S. Poole and published in 1904 by the Canadian Geological Survey. On this map, oil coal is noted at a number of widely divergent points and indicating the existence of very large deposits.

The deposits of oil-shades on McLellan Brook, near Patrick's shaft, have been recently (1911) investigated and some boreholes put down by one of the Government drills. The deepest of these boreholes pierced a thickness of 670 feet of the sales, slates, and sandstones of the locality, the first mentioned rock being greatly predominating.

At a depth of 214 feet a bed of brown oil shale, 2 ft. 4 in. in thickness was encountered; at a depth of 366 ft. another bed, 4 ft. thick, was met with; and a thickness of 70 feet of brown oil shales was pierced by the drill at a depth from 600 to 670 feet.

Some of the oil shales in the cores were analyzed and gave 32.5 gallons oil per lon and one sample gave 30.5 gallons oil and 35.5 lbs. of ammonia per ton.

It is to be hoped that these promising oil shale deposits may be the seat of an important industry in the near future.

THE MINERALS OF NOVA SCOTIA.

(Written for the Canadian Mining Journal.)

EDITOR'S NOTE:—This article was crowded out of our last issue. It is valuable as succint review of Nova Scotia's mineral wealth.

The mineral resources of Nova Scotia, as shown by the symbols on the map,* are of a highly varied character. The shore line is irregular and is provided by nature with many safe harbours. Nova Scotia is almost an island, so that many of the workable deposits are in close proximity to shipping facilities. This Province possesses the only coal deposits at tide-water on the Atlantic coast; and in this part of Canada only are coal, iron and fluxes found in juxtaposition.

The Province is most favourably situated geographically in regard to distribution to world markets; it is 581 miles nearer London than New York, has water navigation to Montreal, and is much better situated to supply markets of New England than many of the States in the United States.

The Coal Fields of Nova Scotia.

The Sydney Coal Field, on the northeastern shore of Nova Scotia and in the County of Cape Breton, is the first to be noticed. Its area of available coal is estimated at 300 square miles. It contains ten coal seams, each of which is from 12 to 3 feet in thickness, besides numerous smaller beds. The coals are highly bituminous and coking; many of the seams yield coal well adapted for gas making. Numerous certificates show a quality almost equal to the Welsh steam coal. Several of the seams enjoy an enviable reputation as good domestic coal for grate and range purposes.

The Inverness Coal Field is situated on the northwestern shore of Nova Scotia in Inverness County. There are three collieries at Inverness, Port Hood and Mabou. Important deposits are known to exist and have been worked at the surface in a desultory manner at Chimney Corner.

The Pictou Coal Field covers an area of about 25 square miles and is noted for the unusual thickness of some of the beds. There are 16 known seams, from 42 to 3 feet in thickness. The coal is not as bituminous as that from the Sydney district, but is still a coking coal, except in the case of a few seams. The coal has its chief reputation as a good strong steam coal adapted for use under all forms of boilers.

The Cumberland Coal Field is not yet explored over its whole extent, but its area has been estimated at 300 square miles. The known seams are from 10 to 3 feet in thickness.

*See last issue.

The coal is similar in character to that of the Pictou district, and is largely used for steam and domestic purposes.

Miscellaneous Coal Fields. In Richmond County extensive prospecting work has been carried out on the coal basin at River Inhabitants, at Kemptown and Debert in Colchester County, work of an exploratory nature has been carried on intermittently for a number of years. Coal has also been found at Big Marsh, Antigonish County, River John, Pictou County, and at various other places in the Province.

The Gold Fields of Nova Scotia.

The Atlantic shore from Canso to Yarmouth is occupied by the auriferous strata. The width of the district varies from 10 to 40 miles and the area of gold-bearing sedimentary rocks in this portion of the Province is estimated at 3,000 square miles.

The Nova Scotian gold is derived entirely from vein-workings. The auriferous quartz veins occur in groups, running parallel to one another in a system of anticlinal domes. They have, in some cases, been traced superficially for a distance of over two miles, and pay-shoots in the vein have been followed to a vertical depth of 1,100 feet.

The worked veins vary in thickness from 30 feet to 1 inch, and are found interbedded in quartzite and slates. The gold occurs in these veins principally in the shape known to miners as coarse gold, and in pockets and strings of various shapes and sizes. It is usually associated with arsenopyrite, pyrite, galena, chalcopyrite, sphalerite, etc.

The gold ores of Nova Scotia may be classed as free-milling, and most of the value may be extracted from the ore by the stamp mill alone.

The natural conditions for the legitimate prosecution of the gold mining industry are favourable. There is a very small amount of overburden; timber for supporting excavations and for fuel is plentiful. The rocks in which the gold veins occur are of a nature that require little artificial support; native labour is cheap and efficient; there are abundant water powers in the vicinity of many of the gold mines; and transportation facilities are good.

The Iron Ores of Nova Scotia.

Iron ore occurs in very many places throughout the Province, as is easily seen by reference to the map.

Beginning at the western end of the Province we have first, the red hematites and magnetites of Clementsport and Torbrook, Annapolis County, representing a range of ferriferous strata, extending from Digby to Windsor, with one interruption in the shape of the Paradise granite. Extensive mining operations are being carried on at the present time at Torbrook on deposits of the interbedded type.

Between Windsor and Truro there are numerous deposits of brown hematite, often highly manganiferous. Among the localities may be mentioned Selma, Clifton and Brookfield.

At Londonderry there is an immense vein of ankerite 30 to 150 feet wide, holding limonite and specular hematite, and extending for many miles, which has been worked for a number of years.

In Pictou County workable deposits of hematite, limonite, specular hematite and spathic and clay ironstone ores are found in the district extending from Glengarry on the Intercolonial railroad to Arisaig on the Gulf Shore. An important deposit exists at Arisaig

In Guysboro County several valuable deposits of specular ore have been opened and worked. The ore from one of these mines at Boylston has been satisfactorily used in the blast furnace at Londonderry.

In Cape Breton valuable deposits of brown hematite and magnetite are found near Lake Ainslie and near Whycocomagh.—Epathic ore occurs on Boulardcries Island. Near East Bay a valuable bed of red hematite, 12 to 6 feet wide, has been traced for some distance. Numerous other deposits of hematite are met at Boisdale, Big Pond, Loch Lomond, Grand Mira and other points on the island.

Deposits of bog iron are known to exist at various places throughout the Province, but as yet have received little attention.

There are many other localities yielding iron ores, which as yet have not been thoroughly prospected.

Limestone suitable for flux is everywhere met in the vicinity of the coal and iron districts.

Copper.

Ores containing this metal are found in the Province in rocks of every age.

The trap associated with the Trias of the Bay of Fundy yields native copper at many points, among which may be mentioned Cape d'Or, Spencer Briar and Five Islands.

Chalcocite and carbonates of copper are frequently met in the Upper and Lower Coal Measures of Cumberland, Colchester and Pictou Counties.

In the vicinity of Lochaber, in Antigonish County, some valuable deposits of chalcopyrite have been proven.

At Coxheath, in Cape Breton County, extensive development has been carried on, on a chalcopyrite deposit.

There are other deposits of copper in the vicinity of Gabarus, Cape Breton County; St. Ann's, Victoria County; Cheticamp, Inverness County; and other points in the Province.

Lead and Silver.

The ore of lead most frequently met here is galena, generally carrying silver, and occurs in the rocks of all ages, but most abundantly in the Lower Carboniferous limestones, which are met with in almost every county. At Gay's River and Pembroke, Colchester County, the ore is met disseminated in limestone, in quantities which have warranted a large amount of exploration. At Smithfield, in this same county, in the same district, a still larger deposit is met. Indications of valuable deposits have also been discovered at Cheticamp, Inverness County; North Bay, Ingonish, Victoria County; East Bay, Cape Breton County; and Musquodoboit, Halifax County.

Manganese.

This ore is frequently found as pyrolusite, psilomelape and manganite in the Lower Carboniferous strata.

Deposits of pyrolusite have been extensively worked at Walton and Tennycape, Hants County; Loch Lomond, Cape Breton County; and in the vicinity of Truro, Colchester County. New deposits have recently been explored in New Ross, Lunenburg County.

Gypsum.

This mineral is found in Nova Scotia in immense quantities associated with anhydrite. It occurs associated with Lower Carboniferous strata in beds frequently 100 feet in thickness.

There are many enormous deposits of gypsum in various parts of Nova Scotia, which exist on tide-water, among the most valuable of which are the ones near Windsor, Hants County; Amherst, Cumberland County; Antigonish, Antigonish County; McKinnon's Harbour, Baddeck and St. Ann's, Victoria County, and Cheticamp, Inverness County. Gypsum occurs in large quantities along the shore line of Cape Breton Island, in the interior, and along the shores of the Bras d'Or Lakes.

The conditions are most favourable for the development of an immense industry in the production of gypsum. A small amount of this material is manufactured in the Province into plaster of Paris, wall plaster, fertilizer, etc., but most of the gypsum mined in the Province at the present time is shipped to the United States in the crude form.

Antimony.

Antimony is found at West Gore and Rawdon in Hants County. The principal deposit is in a vein of the fissure type where antimony comes as stibnite and native antimony, associated with pyrite and pyrrhotite and often carrying high values in gold. This deposit has been extensively worked and large shipments of ore have been made extending over a number of years, to Swansea, Wales and New York, U.S.A.

Tungsten.

Tungsten minerals have been found at Moose River and Waverley, Halifax County (in the form of scheelite); at Emerald, Inverness County (in the form of hubnerite); New Ross, Lunenburg County (in the form of scheelite and tungsite), and at Molega, Fifteen-Mile Brook, Queens County (as scheelite). Extensive exploration work is being carried on at Moose River, Halifax County, with promising results.

Molybdenite.

Molybdenite occurs at New Ross, Hants County; Gabarus, Cape Breton County; and Ohio Road, Shelbourne County.

Tin.

Tin has been discovered as cassiterite and stannite in situ near New Ross, Lunenburg County.

Oxides—Mineral Pigments.

Various beds of ochre and umber have been worked to a small extent at Londonderry, Chester, Onslow, Kentville, Polson's Lake and numerous places in Cape Breton.

Barytes.

This mineral is found at numerous points in the Province and is confined to no particular geological horizon. Little attention has yet been paid to it, and it has been worked to a small extent only.

At Lake Ainslie, Inverness County; Five Islands and Stewiacke, Colchester County; and River John, Pictou County.

Salt.

The Lower Carboniferous rocks and gypsum of Nova Scotia frequently yield brine springs, adapted for the manufacture of salt, but as yet few attempts have been made to utilize it. Among these springs may be mentioned the ones near Antigonish, Antigonish County; Whycomagh, Inverness County; Springhill, Cumberland County; and Walton, Hants County. Strong brine was encountered in a bore-hole at a depth of ... feet at Cheverie, Hants County.

Mineral Springs.

These are numerous. Among the most notable are those near Wilmot, Annapolis County; Windsor, Hants County; Chester, Lunenburg County; Garloch and Sutherland's River, Pictou County; and East Bay, Cape Breton County.

Building Stones.

The building stones of Nova Scotia are chiefly sandstone and granite. The various grades of the former are supplied almost entirely from the Upper Carboniferous, and we therefore find the principal quarries in Cumberland County at Wallace, Amherst, Joggins, Minudie, River Philip, etc.; in Pictou County, at River John, the Pictou Rivers and Merigomish.

On the Basin of Minas various localities in Kings and Hants County yield materials adapted for building purposes. Granite occurs along the Atlantic shore in every variety and texture, etc. Shelburne, Queens, Annapolis and Halifax Counties have yielded handsome varieties.

The Lower Carboniferous limestones have hitherto been used for little beyond lime burning, but they merit more attention for building purposes than they have received. They occur in great abundance and present every variety of texture and composition. At some points in Cape Breton limestones are metamorphosed into marble, as at West and East Bays, George's River, etc., and may prove of commercial value. Flags, slates and clays are abundant and worked for local use.

Grindstones, Etc.

At Joggins and Pugwash, Cumberland County; Merigomish, Pictou County; and various points in Cape Breton County, grindstones and whetstones of good quality are largely cut for local and foreign use.

Diatomaceous Earth.

Deposits of this mineral are met in many of our lakes and swamps. A large deposit has been extensively worked at Bass River, Colchester County.

Oil Shales.

Beds of oil shales, of late Devonian or Carboniferous age, are found in Nova Scotia in the vicinity of many of the coal fields, and at other points in the Province, extending from east of the Avon River, in Hants County, to the eastern part of Cape Breton Island. Among the most important known beds are those in the vicinity of Cheverie, Hants County; New Glasgow and Pictou, Pictou County; Big Marsh, Antigonish County; Lake Ainslie, Inverness County; and McAdam's Lake, East Bay, Cape Breton County. Analyses show many of these deposits to be of a superior character, but little has yet been done in the way of developing them.

Clays.

Clays suitable for the manufacture of bricks, tiles, sewer pipe, etc., are abundant in Nova Scotia, large beds existing in almost every county in the Province. At the present time ordinary stock and pressed red bricks, tile and sewer pipe of different sizes, are manufactured at various points, principally for domestic use.

The industry is capable of large expansion, both as regards material manufactured and export trade.

Fire-Clays.

Large beds of fire-clay occur in connection with the various coal seams throughout the Province. Fire bricks are manufactured at Westville, Pictou County; but not in quantities large enough to supply the home consumption.

Cement.

Slag cement is now being made at Sydney, from slag procured from the Dominion Iron and Steel Company.

LEAD MINING AND SMELTING IN SCOTLAND.

From our own Correspondent. London, September 3rd, 1912.

One of the most ancient industries in Scotland is lead mining, although it perhaps never in its palmiest days reached a large size. There are signs now of a distinct revival of the old industry. The ore was chiefly galena occurring in limestone, and if it was somewhat sparsely distributed it was usually rich and pure when found, so that in view of the small silver content it commanded a good price. When, however, the highly argentiferous lead ores of America were developed the price of pig lead fell from the neighbourhood of 150s per ton (2,240 pounds) to little more than 50s and this, together with the increasing amount of "Black Jack" (zinc blende) got in the native ores, led to the abandonment of all the mines, except in one district. A band of Silurian rocks traverses the counties of Wigtown, Dumfries, and Lanark, and in the limestone deposits of this series among the Lowther or lead hills work is still carried on in several veins, and quite recently operations have received a new lease of life

The two adjoining villages of Wanlockhead and Leadhills are the centre of activity, and the inhabitants are mostly engaged in the mines and smelters The annual output of the mines aggregates close upon 8,960,000 pounds of ore, but of late the greater proportion has been coming from Wanlockhead, where most interesting developments have been carried out The richest lode has been entered in the valley just below the village, and followed to the dip in a north easterly

direction by means of an inclined shaft some of the levels from which have penetrated over a mile and a half into the hills. Much of the ore now raised from the deeper levels, about 200 feet down, contains in addition to the associated vein stuff (calcite) a deleterious proportion of blende, which interferes with the smelting operations unless it is removed. To accomplish this the Wanlockhead Lead Mining Company installed little more than a year ago what is, according to a leading Scottish daily paper, perhaps the most up-to-date and perfect dressing plant to be found in the United Kingdom.

The new concentrating mill is capable of handling 22,400 pounds of ore per hour continuously, and can deal with 26,880 pounds when pushed to its utmost capacity. The ore is automatically tipped into trolleys which discharge it over grizzlies on to the conveyor belt, from which gangue is picked out by hand and washed by water jets. The large pieces of ore are reduced by crushing in two stages, first by rock breakers and then by rolls, the separate products from which are elevated to a long series of graded trommels delivering uniformly sized particles to duplicate sets of water jigs arranged on each side of the floor. These effect a good separation of the first four sizes of ore particles down to 4 mm. giving clean galena in the first compartment and almost pure blende in the third and fourth, whilst the middlings from the second compartment contain both minerals and have to be recrushed and jigged after another classification to size.

The very finest ore particles are carried as slime through an elaborate series of pointed box settlers of the Luhrig type, and the separation is completed by means of oscillating Buss tables and Luhrig slime vanners, which can be supplemented if need be by two circular buddles and a mechanically operated dolly tub. The products are (1) tailings which run into a large tank, from which clean water overflows to the stream, and the clean sediment is elevated to the dump; (2) a high grade of zinc glende, containing very little pyrite, which is carted away for export; and (3) very pure galena containing over 80 per cent. of lead. which is trammed in 11,200 pound lots about half a mile down the valley to the smelter. The larger grades are ready for use, but the fine particles of ore are sintered into lumps by a partial roasting in a small reverberatory furnace.

The type of furnace still used was originated in the district, and has been only slightly altered, although modifications of the Scotch ore hearth were for a time used in the North of England, and a Jumbo water-cooled hearth was tried in America. The furnace base is set in masonry and consists of a cast-iron sump 30 inches long by 22 inches wide, and about 6 inches deep, which is kept full of lead, any excess flowing over the workplate into the lead pot. The front is open, but the sides and back are made up of a height of 18 inches by means of two hollow iron blocks called "stones" which retain the charge, comprising a mixture of ore, coal and a little limestone. Air is blown through the charge from a tuyere at the back, thus burning the fuel and accomplishing the roasting and reduction of the ore at the same time. Two workmen are required to attend each hearth, and every five minutes it must be rabbled to pick out slag or infusible lumps, and fresh ore and fuel is added. The compaign runs from Monday morning until Friday evening, three sets of men taking eight-hour shifts and producing about 2,240 pounds of pig lead each shift. The labour is not excessively hard, but is almost continuous, and there is very little danger from the fume produced as this is drawn away by the stack over the hearth, and a ventilating hood over the workplate sucks away any poisonous fume rising off the rabbled charge.

The process is very economical in fuel consumption, only taking about 560 pounds of coal per 2,240 pounds of lead produced, and this is due to a considerable amount of heat which is generated by the oxidation of the suplhur in the ore. The first yield of lead is only about 60 per cent., and this would not be profitable if it were not for a very perfect system of waste recovery which sets the slag aside for retreatment in a slag hearth similar to the ore furnace, but larger, and, further, the fume is practically all condensed in water scrubbers before the gases are passed into a horizontal settler and a flue or duct leading half a mile uphill to the chimney. Two hearths are usually at work on ore, and other two on recovered fume, which contains about 60 per cent. of lead and yields, about half the quantity of lead that the ore produces. The method of work is admirably suited to the local conditions of scarce fuel and cheap labour, which is not highly skilled. The hearths are best adapted for small outputs from a highly concentrated or pure ore, where this is not very abundant, thus necessitating intermittent working. That such an old method should be able to hold its own against the competition of large producers testifies to the high efficiency to which the various operations have been brought and maintained.

THE SCHEELITE DEPOSITS OF NOVA SCOTIA.*

By Victor G. Hills.

Scheelite camp is situated five miles northeast of Ship Harbour, Long Lake, and 34 miles by waggon road from Stewiacke, the nearest railway station, in Halifax County. The scheelite deposits occur in veins of the same formation and character as the gold bearing veins of the region. The Nova Scotia peninsula is occupied by granite and Lower Cambrian quartzites and slates. The striking characteristic of the veins is their similarity to the saddle reefs of Bendigo, Australia. Thus in both cases the formation is quartzites and slates, much crumpled and folded; there is the same development of parallel anticlines inseries; in both fields, the movements causing the folding appear to have a common origin with neighbouring intrusive-granite; while other points of similarity are: the metamorphism of the sedimentary rocks is dynamic; the metalliferous deposits are in quartz veins paralleling the original sediments and were folded with them; other lodes are found crossing or connecting the regular interbedded veins; the most common ore deposit is gold associated with arsenopyrite; and the ore-shoots usually parallel the folds. The points of dissimilarity

*Abstract of a paper presented at the Annual Meeting of the Canadian Mining Institute, Toronto, March 1912.

between the two regions are that the anticlines in Nova Scotia are from three to five miles apart, while in Bendigo they are from a few hundred feet to a quarter of a mile apart; and in Bendigo there is some evidence of igneous activity. In Nova Scotia the metamorphism seems to be entirely dynamic.

The scheelite deposits, in the Moose River Gold Mining district, occur on the same anticline two miles to the west of the old gold mines. The peculiar crumpled or corrugated form of the veins is unique and interesting. Two explanations have been advanced to account for their exceptional sinuosity. Woodman holds "that the sinuous courses shown represent the outlines of the fissures formed by the folding pressure which were afterwards filled with quartz; and that "the evidence is of continual accretion inward, on both sides, as in other fissure veins and not from a central primary layer outward." Fairbault, on the other hand, maintains that the quartz veins were formed with the slate beds, being gradually deposited during the earlier period of metamorphism and deformed into these wrinkles by differential pressure causing the slate to crush and buckle between sliding bands of harder quartzite. This view is shared by the author.

The main anticline strikes S. 67 degrees W. and has a pitch of about 7 degrees to the west. The veins are interbedded or intercalated and are usually in the slate rather than in the quartzite. At Scheelite camp three faults, the throws of which are from 10 to 70 feet, cross the folds. The 70-foot horizontal throw appears to have but slight vertical displacement; the second fault displaces 5 feet horizontal and 11 feet vertical. No scheelite or mispickel has been found in the faults. The veins are numerous and small, usually from one to six inches, but sometimes widening to several feet near the anticlines and synclines. The scheelite ore-shoots are rather more regular and continuous than is the case in most of the tungsten deposits of the world, but are not so closely confined to the anticlines and synclines as are the gold deposits. The vein matter is quartz, ankerite, scheelite, and arsensopyrite, while there is also a little pyrite and calcite, and a few slender tourmaline crystals present in the quartz, in the calcite and in the scheelite. No gold, beyond a trace, has been found here; but a litle scheelite in the old gold mines at Moose River.

The natural conclusion that the scheelite was formed by alteration from ankerite, does not appear to be borne out by the obtaining conditions.

SLOCAN DISTRICT, BRITISH COLUMBIA.

By E. Jacobs.

Continuing my notes on my visit to Slocan mines, made in August, brief mention will be made of the Rambler-Cariboo Extension, and the Rio, also some others that were passed when going from the Rambler-Cariboo up by the Washington and R. E. Lee, thence to the Surprise and Noble Five.

RAMBLER-CARIBOO EXTENSION.—The short account of this property included in the official report for last year is as follows: "In running the main Rambler-Cariboo tunnel, a vein was cut at 2,100 ft. from the portal, in ground which did not belong to the Rambler-Cariboo Company, although it was held by allied interests. The vein was apparently not known on the surface, although exhibiting considerable strength at the adit-tunnel level."

From Mr. W. E. Zwicky, manager of the Rambler-Cariboo, who also directs the development of the Rambler-Cariboo Extension and Rio properties, it was ascertained that the drift on the Extension vein from the Rambler-Cariboo adit, was in, at the time of the visit, about 350 feet, and that it was expected ore would be met with very soon; it might be encountered any day. I have not heard whether this expectation has since been realized.

RIO.—The Rio property is described as being situated in the same basis (McGuigan) as the Rambler-Cariboo, but at an altitude of about 7,000 feet, which is approximately 1,000 feet higher than the Rambler-Cariboo mine. The Provincial Mineralogist states that the original owners had driven, on this property, an adit about 200 feet, which cut near the surface a shoot of dry ore which was not sufficiently rich to be shipped from that place at a profit. Farther in a shoot of galena about 6 inches wide and continuing 20 feet in the level, was cut. Since its present owners acquired the Rio there was shipped from this upper tunnel 15 tons of ore from which a net return of about $3,500 was received.

The development work done by Mr. Zwicky includes a lower adit, at a depth of 180 feet below the tunnel above mentioned, which cross-cut reached the vein at about 500 feet from the portal. Nearly 250 feet of drifting was done before the downward extension of the oreshoot occurring in the upper tunnel was entered; this shoot was found to be something like 50 feet in length, and the ore contained more galena than in the higher working. Drifting was continued beyond this oreshoot until at about 180 feet farther along the vein a second oreshoot was entered.

The position last August was that one car of ore had been shipped to Trail, and ore was being taken out for another carload. Pack horses take the ore from the mine down to the old millsite, where it is loaded on wagons and hauled thence by road to the railway at Three Forks. It was stated that should the development work, being done some time since, continue satisfactory, a cross-cut would be driven from No. 3 level (upper workings) of the Rambler-Cariboo to the Rio vein, and thus open the latter property at considerable depth.

SOHO GROUP.—Along the wagon road, between the Rambler-Cariboo camp and the angle of the road below the site of the old Washington concentrator, there was seen a notice of intention to apply for a certificate of improvements for the Laughing Waters claim "located in McGuigan Creek basin, across the nose of the mountain spur between the Best and Washington basins." It was understood that this is one of the Soho group, on which Mr. W. H. Shomer, of Ypsilanti, Michigan, has been engaged in survey work in July and August

WASHINGTON.—No work was being done on the Washington group, which includes the Slocan Boy, situated high up the mountain, across from the Payne. The latest published information available concerning the Washington is that communicated by Mr. J. L. Retallack, manager for the mining partnership known as Retallack & Co., owners of the Whitewater and other properties, and chief shareholders in The Washington Mine, Limited. No work has been done on the Washington group this year, but during the immediately preceding two or three years something like 3,000 feet of development has been carried out. It is estimated that about 40,000 tons of concentrating ore has been developed, this ore containing from 5 to 6 per cent. lead, 20 to 25 per cent. zinc, and silver to the amount of about 2 oz. to the unit of lead and 0.25 oz. to the unit of zinc. The provision of milling and transportation facilities is requisite however, before this ore can be utilized.

R. E. LEE.—There are other mining properties in the vicinity of the Washington, but it did not appear that any of them were being worked. Passing thence up to the summit of the divide, the R. E. Lee upper workings were seen, but these, also were not then being worked. After a look in at the R. E. Lee cabin, the trail was followed down the Cody Creek slope of the mountain, past the entrance to the low-level adit of the R. E. Lee, and the Ajax, and thence up to the Last Chance camp, where the men working at the Surprise have their bunk and boarding house accommodation.

SURPRISE.—The development of the Surprise property during the last few years has been one of the most striking demonstrations of dogged persistence, in the face of very great difficulties, known in Slocan district. First, the Last Chance No. 3 adit was extended more than a thousand feet into Surprise ground, and the long and tedious work of raising about 800 feet was undertaken. Connection had been made with the old Surprise workings only a few weeks before the mine was visited in August. Much exploratory work had been done in addition to the actual rise itself, before the winze from the Surprise No. 3 cross-cut was connected with. There was much water in the old workings of the Surprise, but this had been drained away, although the lower workings, from the Last Chance No. 3 up, were still far from dry when visited. It was found that drifting on the vein was in progress at 120 and 220 feet, respectively, above the Last Chance No. 3, and that ore was showing in both drifts, that in the higher drift being the more promising at that time. No information has been obtained relative to the progress made during the last month, but the indications were favourable to production of ore whenever stoping should be undertaken.

NOBLE FIVE GROUP.—It was found that twenty men were being employed on the Noble Five group—a few in cross-cutting and raising on the Noble Five vein to make connection with the Last Chance vein, which latter dips into the upper claims of the Noble Five group, and the others in the Deadman mine of the group.

In addition to the two above-mentioned veins, there is on the property another vein known as the Deadman vein. All three veins are, approximately, parallel. The Deadman vein is east of the others, and on this considerable development work has been done, with generally very encouraging results. Levels Nos. 1 to 4 with several intermediates, have been opened.

In the old workings on No. 4 the present superintendent, Mr. McAllister, found the drift stopped at a strong fault cutting almost squarely across the course of the vein. Work was re-started here, and after the fault had been followed about 25 feet to the right, the vein was found. As the fault is normal and not extensive, work was undertaken on several lower levels down to No. 1, inclusive, and, so far in each instance where the drift has been carried forward, the same fault has been encountered and the vein afterward picked up beyond it under almost identical conditions as on No. 4 (the highest) level.

An interesting feature of this work is that on each level which has been driven beyond the fault, a shoot of galena-zinc blende ore has been found, and this orebody appears to be continuous vertically from No. 4 down to No. 1 level. The ore shoot is, apparently, 35 to 60 feet in length, and from one foot to four feet in thickness. Much of the ore is either silver-bearing galena or zinc blende of remarkably good grade for this camp. A considerable proportion of the blende is estimated to contain 55 to 60 per cent. zinc. Beyond the ore shoot on each level now carried forward the vein pinches for a short distance, afterward becoming freer again, with indications favourable for another shoot of ore ahead. No. 1 level is in 230 to 240 feet; there is now available an abundance of ore suitable for mill feed, so the desirability of again running the concentrator, situated down on Cody Creek, is being recommended. A car of lead ore was shipped in July, while in August one of ore running high in zinc was sent out.

ZINC ORE IN NOBLE FIVE MINE.—Although it is about seven years since the field work was done for the "Report of the Commission Appointed to Investigate the Zinc Resources of British Columbia," the information then obtained relative to the Noble Five group may be regarded as still applicable, since not a great deal of development work has since been done, and but little ore has been shipped.

The Noble Five was one of the properties reported on by Mr. A. C. Garde, who assisted Mr. Philip Argall in the field-work of the Zinc Commission. Mr. Garde reported, in part, as follows:

"This group is owned by the Hon. James Dunsmuir, of Victoria; it adjoins the American Bay on the east. On account of litigation the property has not been operated for several years, but at one time produced a considerable tonnage of high-grade silver-lead ore, which in some cases changed into zinc blende. On one of the claims, called the Deadman, three levels have been driven on a 2 to 3 ft. vein. The strike of the vein is 55 deg. east of north, dipping at an angle of 70 degrees to the southeast and flattening somewhat in a winze sunk from the second level. This level, being the only one of interest from the zinc point of view, was examined. It was found that the level was first driven 25 feet along a slip in the slate formation. At this point a cross-cut was made into the hanging wall toward the east for a distance of 20 feet, where the main vein was encountered, and explored in a northeasterly direction for a distance of 120 feet. Next to the hanging wall and along the floor of this drift a lens of zinc blende averaging 12 inches in thickness has been exposed for nearly the whole distance. About 20 feet from where the vein was first encountered a winze has been sunk to a depth of 100 feet, proving the existence of the orebody all the way down, but decreasing somewhat in size at depth. About half way down the vein flattens out to an angle of 55 deg.......

"In this winze I took a three-cut sample averaging 12 inches in width. It assayed 55.6 per cent. in zinc and 15.1 oz. in silver, and represented the best part of the lens. The vein itself is from 2 to 3 feet wide, and a little galena is occasionally mixed with the vein matter. The zinc occurs, however, essentially as a clean blende. From present developments no considerable tonnage of ore can be estimated, but I believe that the showings warrant the owner in developing the property and blocking out the ground between Nos. 2 and 3. Present work on the property was done some time ago by lessees who extracted all the galena in sight. They discontinued working as soon as the ore changed into zinc. . . . .

"Exposures of zinc ore were reported on other claims of the Noble Five group, but as the workings had caved in, these were not examined.

"Besides having good accommodations for men working at the mine, the property is equipped with a 100-ton concentrator at Cody, which is connected with the mine by an aerial tramway. The concentrator is not arranged for saving zinc ore, so would require remodeling, but it is conveniently situated for handling concentrating ores from various adjacent properties, and the machinery is being kept in good repair."

(It will be observed that Mr. Garde's account of the mine varies in some details from that first given above, but to later developments may be attributed the chief differences between the two descriptions.—E. J.).

RECO AND GOODENOUGH.—Owing to heavy rain necessitating a much longer stay at the Noble Five than was intended, there was not time to visit the Reco and Goodenough mines and then walk to Sandon before dark. However, present operations in the Reco are only on a small scale, and nothing is being done at the Goodenough, so that little would have been ascertained of these properties had a call been made at them. It was stated in the neighbourhood that another strike of good ore had lately been made in the lower workings of the Reco, but production from the property has been comparatively small in quite recent years. Mr. A. C. Garde's description of the mine follows:

"This property, which adjoins the Noble Five on the east, is one of the oldest and best known local mines. It consists of five Crown-granted claims, with a total of 150 acres. No attempt was being made to hand-sort any of the zinc ore associated with the high-grade galena. On account of the blende containing high silver value, it has been found more profitable to leave it with the galena even if it be at times necessary to incur a penalty on the excess of zinc. Past experience with zinc ore shipments to Swansea, Wales, was very discouraging. For a 67-ton lot of blende, containing 50 per cent. zinc and 99.5 oz. of silver to the ton, the Hafod smelter in 1898 refused to pay anything for the silver content.

"One of the Reco veins (No.3), which is narrow but of very high grade, was worked in connection with the adjoining property (the Goodenough) for some time, on account of the vein running into the latter. The Reco has produced a considerably larger quantity of ore from it than the Goodenough, and is being operated extensively at the present time. There are in the Reco property three veins, which strike parallel to each other. The property is one of the constant dividend-payers of the Slocan, and so far has distributed, approximately, $300.000.

"Ore shipments are handled over the Reco trail to the railway siding—a distance of four miles—in a unique and cheap manner, during the winter season, this being 'sliding' or 'rawhiding' on the snow. A one-ton parcel of ore, consisting of about one dozen sacks, is wrapped and laced into a raw cowhide, this is dragged by one horse down the mountain trail, which has a down grade of about 17 per cent. Beside the rawhides, the same horses, on their return trip, pack provisions and supplies to the mine. Two men are able ordinarily to attend to twelve horses; occasionally a few more. Rough-locking is done with common log chains. A hide usually lasts one season, but if well taken care of and provided with wooden runners, it will last longer than that. This method of transporting ore is also employed by other mines around Sandon, located similarly to the Reco. In a ruggedly mountainous country, such as this, where the snowfall attains a depth of several feet each season, a more economical way of handling galena ores in small quantity could not be introduced. Tramming, by means of gravitation, is certainly cheaper, but it involves a considerable outlay, which is seldom warranted when the tonnage is small."

"**GREY COPPER CLAIM**. The Goodenough property is situated east of the Noble Five group and adjoins the Reco mine to the south. It consists of the Grey Copper claim and two fractions, having a total area of 50 acres. It has two parallel veins, of which the upper one of the Goodenough fraction is known as the continuation of the Reco vein No. 3, in conjunction with which it was worked from 1894 to 1902. During that period there was shipped 450 tons of hand-sorted galena, averaging 45 per cent. lead, two per cent. zinc, and 300 oz. of silver to the ton. The greatest thickness of this vein is 30 inches, and its average thickness only 8 inches. Four levels, respectively 66, 225, 600, and 775 feet long, have exposed the vein to a vertical depth of 450 feet, with a total stoping area of 3,300 square feet.......The Grey Copper vein, while so far not productive of a similar high grade of ore as the upper vein, has the advantage of being considerably wider and more regular. It promises to become of importance as a zinc producer.

"There are two levels in the Grey Copper workings—the upper is 50 and the lower 120 feet long. Those levels have been driven on the vein, which is from 5 to 6 feet wide, and outcrops plainly at the surface. The strike of the vein is north 55 deg. east; the dip is to the southeast at about 70 deg. The vein cuts through a large porphyry dike at nearly right angles, and has in every respect the appearance of a well-defined and true fissure. The porphyry dike can be followed across the Grey Copper, Texas, and Deadman claims, and has a width of nearly 1,000 feet. Above the dike the usual slates and shales make their appearance. They have a bedding strike of about northwest and southeast and can be seen on the surface as well as in the workings of the upper Reco-Goodenough vein. The same grade and character of ore is found on both levels, but the paystreak in the lower one is twice the size of that in the upper one. In the latter it averages 12 inches, and in the former 24 inches in width. Approximately 1,000 tons of ore has been blocked out on three sides between the two levels, which are 85 feet apart, measured on the dip of the vein. A five-cut sample was taken in the lower tunnel. It represented an average of 24 inches of ore in width; it assayed 42.6 per cent. zinc, 18.8 lead, and 33.2 oz. silver to the ton. As will be seen from this analysis, the ore is of a heavily mineralized character, and requires to be

separated more than to be concentrated. Hand-sorting would be of little use, unless it were followed by concentrating of the 'sortings.'......

"By trail, the Grey Copper camp is four miles from the nearest railway shipping point (Reco Siding). The present cost of transporting ore by means of packhorses is $3 per ton, but with a large output the rawhiding method would no doubt be introduced during the winter season, thereby materially lowering the cost of transportation.

"From its upper vein, the Goodenough Mines, Ltd., extracted at one time $80,000 worth of galena and paid in dividends $45,000. While the second vein on the Grey Copper claim is still only in a prospecting stage, it is very promising, and is one of the most interesting prospects in that locality."

THE COLONIAL COAL CO., LTD.

The Colonial Coal Co., Ltd., with head offices in North Sydney, was organized a little over a year ago to take over the old Colonial Company and the Mackay Mining Co. Mr. W. A. Mackay, of North Sydney, is president and general manager.

The company control the coal leases over an area one-half mile wide by 4½ miles in length extending

Colonial Coal Co.—View of Loading Pocket.

from Sydney Harbour to the Little Bras d'Or Lake. This property lies to the south of the Nova Scotia Steel & Coal Co.'s areas. Four seams of coal of workable thickness are known to outcrop on the property. The average thickness of these is 4 ft. 6 in., 4 ft., 5 ft. 6 in. and 5 ft. 8 in., respectively. So far only the 2nd and 3rd seams have been worked. Other seams ranging in thickness up to 2 ft. have also been found.

The company are at present operating two collieries, the Mackay mines on seam N. 2, near the centre of the property and the Colonial mine on seam No. 3 on the shore of the Little Bras d'Or. About one hundred men are employed mostly on construction work and development. Both mines have railway connections with the Intercolonial Railway. In addition to this the company have a coaling dock on the Little Bras d'Or at the Colonial mine where vessels drawing 20 ft. can take cargo.

The difficulty of disposing of the slack from the Mackay mine lead Mr. Mackay to go to Europe and make a study of the briquette plants in operation there. As a result he has installed at the Mackay mine the first briquette plant in America to operate on soft coal.

The binding material used is coal pitch obtained from the by-product coke ovens of the Dominion Iron & Steel Co. at Sydney. This is ground and elevated to a five-ton hopper. Slack coal from the bankhead or the stock piles is feed to a similar hopper. From these hoppers rotary distributing plates feed the ground pitch and slack coal in the proper proportions to a screw conveyor. From 5 to 6 per cent. of pitch is used. The conveyor passes the material to a squirrel-cage disintregator where it is thoroughly pulverized. It is then elevated to the mixer where it meets with superheated steam at a temperature of 600 degrees F. This liquifies the pitch and mechanical agitators mix the material until every particle of coal becomes coated with the liquid pitch. A screw conveyor takes the material from it is pressed into ovoid briquettes by machine where it is pressed into ovoid b briquettes by passing between heavy indented rollers. After leaving the press the briquettes are screened to remove any fines or broken briquettes and are then elevated to storage bins over the railway tracks. The fines are returned to the disintregator. The capacity of the plant is 10 tons per hour.

Recent tests made on the Intercolonial Railway go to show that the briquettes from the Mackay mill are super-

Colonial Coal Co.—Briquette Machine and Mixer.

ior to lump coal for steaming purposes. The briquettes entailed less labour in stoking, gave an even, clean fire, and burned entirely free from clinker. Another advantage is that on coming in contact with the fire the briquettes do not decrepitate and so form no fines or cinders to be carried up through the stack, thereby lowering the efficiency of the fuel and endangering the surrounding country.

The success of the plant at the Mackay mine has encouraged the company to go more extensively into the business. They are at present installing a similar plant with a capacity of 20 tons per hour at their Colonial mine. Here they have a seam of coal 5 ft. 6 in. in thickness, perfectly clean and free from slate, and of a high calorific value. The roof is a strong sandstone requiring little timbering, making mining cheap and easy. The only difficulty with this seam in the past has been that the coal is exceedingly friable and will not stand shipping. The company now propose to turn all this coal into briquettes.

MANUFACTURE OF SEWER PIPE IN N.S.

Written for The Canadian Mining Journal.

There are a number of clay-working industries in and about the town of New Glasgow. The principal one of these is the plant of the Standard Drain Pipe Company. The main works of this company are situated in St. John, P.Q., but the Nova Scotia branch is expanding every year. The New Glasgow plant was started in 1903, but was totally destroyed by fire in 1907. It was rebuilt in 1908 with three burning kilns, which number has been added to year by year until there are nine kilns at present. Most of the pipe manufactured is shipped to Montreal by railway and the output at present is about 1,000 car loads a year. Recently the company has commenced to make hollow tile for building purposes and the demand for these is constantly growing.

The company owns 25 acres of land in the town limits of New Glasgow. Two clay quarries are operated, one of which is right near the works. This is a deposit of soft red clay about nine feet thick and has only four inches to fifteen inches of alluvial material to be stripped. This clay is loaded into cars at the quarry face, trammed out to the mouth of the working and then drawn up on a small machine to a stock house 300x50 feet. All the excavation is done by contract.

The other quarry is situated about 1,000 feet away. The clay at this point consists of a soft gray shale which has a high fusing point. This shale contains some graphite and if used alone the pipes have to be fired very slowly in order to prevent bloating. This clay also shows a rather high percentage of soluble salts, and this was at first believed to prevent the formation of a good salt glaze. This difficulty was subsequently found to be due to the ware not being fired hard enough. There are also a few siderite concretions which some times cause fused specks in the pipes. The shale is mined and sent to the same stockhouse as the red clay in cars of one-half ton capacity by means of an aerial tramway. This endless rope tramway is driven by a rope sheave on the main shaft of the mill.

The two clays are mixed in the proper proportions and taken from the clay shed to two nine-foot dry pans where it is ground to the required fineness. It is then conveyed to a revolving screen and the undersize discharged into a storage bin. The fine clay is drawn from the bin into four seven-foot wet pans where the proper amount of water is added to convert it into a highly plastic mass.

From the wet pans a bucket elevator conveys the tempered clay to the press feeders. There are two presses, one made by the Taplin Rice Company, of Akron, Ohio, the other type being that manufactured by the Stevenson Company, of Wellsville, Ohio. Both the presses are operated by steam pressure supplied from the battery of three 100 h.p. return tubular boilers made by I. Matheson & Company, of New Glasgow. All sizes of drain pipes 2 feet in diameter, are squirted in these presses. Different sizes are obtained by changing the die on the lower end of the press. The squirted sections of pipe are removed singly from the presses on hand trucks, and placed on a large drying floor on the spigot end, while a workman paints the other end with a wash of manganese dioxide, when they are invested and left to dry on the socket end. The drying process requires from 30 to 60 hours according to the size of the pipe. When the pieces are thoroughly dry they are taken down on trucks to the ground level by means of a gravity elevator and placed on end three tiers high. The kilns are of the down-draft type of bee hive form. After the kilns are full the doors are bricked up and sealed, and the heat increased slowly from day to day until the temperature reaches 2300° F. The glaze is secured by placing salt on the fire in the fireholes whereby the atmosphere in the kiln is charged with salt vapor. The temperature is judged by the eye and also controlled by Seger cones in front of the peep holes. After glazing, the fireholes are closed and the kiln allowed to cool off gradually. The whole process occupies 10 days from the time the pipes are charged until they are ready to remove for shipment. They are loaded into railway box cars on a track which runs close to the kilns.

The plant employs 120 men and works for eleven months per year. The main building is 225 x 87 feet, and is three storeys high. Power is supplied by a 350 h.p. Laurie Corliss engine. Electric light and power is supplied by a small 15 h.p. horizontal slide valve high speed engine belted to a D. C. generator.

A LARGE ELECTRIC HOISTING ENGINE.

Written for The Canadian Mining Journal.

It is only very recently that the question of employing electricity for the operation of large main shaft hoisting engines has come to the front in Canada, we refer to hoisting engines with peak loads of 1,000 h.p. or more, a description therefore of a recent installation in Nova Scotia, and which is by far the largest electric hoisting engine running in this country will no doubt be of interest.

The engine in question has lately been installed and is now in operation at the No. 14 Colliery of the Dominion Coal Co., the following being the principal technical particulars: Output, 150 tons per hour; length of shaft, 5,000 feet; gradient, 25 per cent.; hoisting speed, 30 feet per second.

Owing to the conditions of working and there being but a single track down the slope, the hoist is of the single drum type and operates under unbalanced conditions.

Perhaps the most interesting feature is the method of electrical control used and which is the Ward Leonard System, a brief description of which is as follows:—

The hoisting motor is a direct current shunt wound motor, but excited at a constant value from a separate source of supply. Under this condition the speed of the

motor is practically proportional to the voltage across the armature and quite independent of the load on the motor.

The winding motor receives current from a direct current shunt wound generator, usually termed "control dynamo," which is also excited from an independent source, but by means of a suitable regulator the current passing through the field can be regulated from zero to its full value and in either direction.

This control dynamo is driven by a three-phase motor to suit the source of supply available, and a small exciter is also coupled to this set for exciting the shunt fields of the hoisting motor and control dynamo mentioned above.

The speed of the control dynamo being constant, the voltage at its armature terminals is proportional to the field current passing, and as the armature is connected electrically to the armature of the hoisting motor, the voltage at the terminals of the hoisting motor and thus the speed, is porportional to the field current of the control dynamo.

It can easily be seen that if the direction of this field current be reversed, the polarity of the control dynamo and thus the polarity and direction of rotation of the hoisting motor is also reversed.

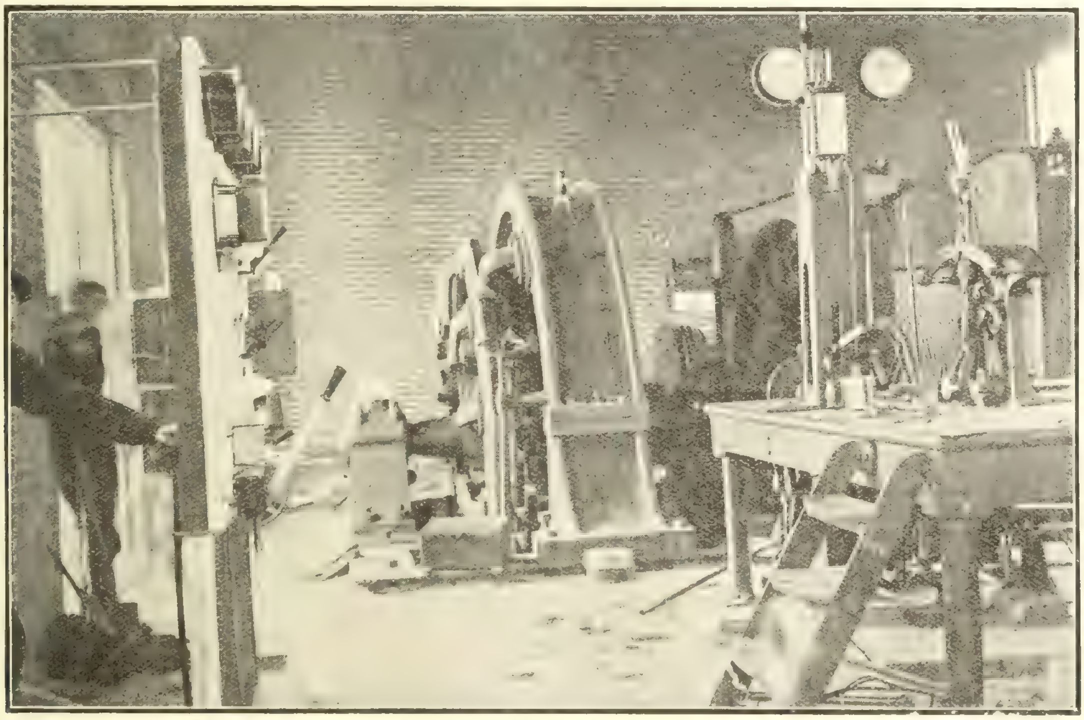
The field regulator is connected directly with the driver's control handle, so that the speed of the winding motor corresponds exactly to the position of this handle, and is quite independent of the load.

It will further be seen that when the winding motor is running at full speed, if the field current of the control dynamo be reduced, the momentum of the load and the revolving parts tends to keep the hoisting motor running at full speed. The voltage of the control dynamo having fallen, however, the voltage of the hoisting motor will overcome this, the hoisting motor then acting as a generator, and the control dynamo as a motor. This of course gives a powerful braking action until the system is once more balanced and the hoisting speed has altered itself to correspond to the new conditions. Being an electrical action it is of course practically instantaneous, so that whether starting or stopping the speed of the widening motor exactly corresponds to the position of the driver's handle, and is under complete control.

The hoisting motor works up to a peak load of 1,360 h.p. when starting, and has a full load speed of 72 r.p.m. The maximum voltage is 600 volts and excitation pressure 220 volts. The control dynamo has an output and voltage corresponding to the hoisting motor, the speed however being 735 r.p.m.

The three phase motor driving the control dynamo and exciter has a mean output of 800 h.p., capable of working up to 1,600 h.p. on the peak load, and is designed for 2,200 volts, 25 cycles and 735 r.p.m. full load speed.

The exciter has an output of 18 k.w. at 220 volts. A depth indicator is provided arranged by means of cams to prevent the driver from accelerating too quickly, and also to stop the motor at the end of the wind, by returning the control handle to the off position if the driver fails to do so.



Siemens Bros. Electric Coal Hoist, No. 14 Colliery.

A Karlick Recording Tachograph is also provided which gives a complete record of the time and speed of each trip.

Coming to the mechanical features it will be noticed from the illustration that the hoisting motor is direct coupled to the drum, doing away with any intermediate gearing which thus ensures steady running and absence of vibration.

The winding drum is of the cylindrical type with cast iron cheeks. On the rim of each cheek is cast a brake path accurately turned. The shell is also of cast steel made in sections and bolted to a flange cast on the cheek. There are two sets of massive post brakes with compressed air engine for 60 lbs. pressure, including the Whitemore patent self-adjusting and variable load appliances, by means of which the load on the brakes corresponds to the position of the brake lever.

The equipment further includes an electrically driven air compressor and receiver for the brakes and all necessary switch gear, both three phase 2,200 volts and direct current.

THE BATHURST IRON DEPOSIT, N.B.

The development of the Bathurst Iron Deposit by the Canada Iron Corporation, Limited, by W. F. C. Parsons, chief engineer, and E. M. Archibald, mechanical engineer.

The Bathurst iron deposit is located on the Nipisiquit River in the County of Gloucester, N.B., about 24 miles south-west from Bathurst town. The mines are connected with the Intercolonial railway by a branch line owned by the company. The length of this line is 17 miles. The iron deposit consists of several large lenticular deposits of which numbers 1 and 3 are the largest. Number 1 lense is 2,300 feet long averaging about 130 feet in width and has been drilled to a depth of 527 feet, proving the continuity of the ore to that depth. Number 3 deposit is 6,000 feet in length with an average width of 75 feet. Drillings to the depth of 347 feet also show that this lense has a good depth. It is figured that in Nos. 1 and 3 deposits alone there is over 20,000,000 tons of ore available.

The present mining operations of the Canada Iron Corporation, Limited, is confined to No. 1 deposit which is on the west side of Austin Brook near the junction of this stream with the Nipisiquit River. This deposit rises about 70 feet above the bed of the Austin Brook and is being worked as an open quarry with a face of 60 feet. Large blasts are set off and the material is loaded into small 2¼-ton cars by steam shovel. It is then trammed a short distance to the foot of an inclined trestle running to a bankhead. On this trestle an up and down car haul is operated, consisting of two endless chains with hooks spaced 12 feet apart to engage the axles of the ore cars. The up-haul conveys the loaded cars to the brow of the trestle where the cars run by gravity to a revolving tipple, which delivers the ore into the hopper of a No. 8K Gates crusher. The empty car gravitates to a kick back where it is automatically switched to the down haul track. The down haul catches the empty car and returns it to the foot of the slope ready for re-loading. From the hopper into which the loading car discharges, the ore passes directly to a No. 8K crusher where it is crushed to pass a 3½-inch ring and then is delivered on to a conveyor belt to be passed into the crushing department of the concentrating mill.

Plant.—1 Inglis Corliss Tandem Compound 16x32x36 inch, which operates the bankhead apparatus and crushing machinery.

Boiler Plant.—There are three McDougall Return Tubular boilers 72 in. by 16 ft., rated at 125 h.p. each, with 34 in. by 60 ft. steel stacks, and two Robb tubular boilers of the same size.

Comperssor Plant.—The air compressor is an Allis Chalmers 2 stage cross compound 16x26x16¼ and 26½ by 18 capacity 1290 cubic feet per minute of free air at 120 r.p.m. The central condensing plant consists of a 500 h.p. Worthington Barometric condenser to which all engines but the mill engine is piped.

The branch line between the mines and the Intercolonial Railway is the Northern New Brunswick and Seaboard Railway. It is laid with 85 lb. C.P.R. standard section rail and class A Dominion Government specification steel bridges. The rolling stock consists of 60-50 ton steel hopper cars, one I.R.C. standard consolidation locomotive and combination baggage and passenger car. The concentrates are then shipped to the company's ore pocket at Newcastle on the Miramachi River. The mine is equipped to handle about 1,000 tons per day. The loading plant at Newcastle consists of 13,000 tons ore pocket. The ore is delivered from this pocket through a series of chutes into a continuous horizontal bucket conveyor operated on a track. This conveyor delivers the ore into an outer 150-ton pocket situated on a dock. From this pocket the ore is loaded into the vessel by means of a self-trimming chute. This plant is capable of loading at the rate of 3,000 tons per hour, and is operated by five men.

The run of mine ore after receiving its primary crushing in the NO. 8K Gates gyratory crusher to pass a 3½-inch ring then passes through a secondary crushing to reduce it to a 2-inch size. It is then discharged into a storage bin of 700 tons capacity, the sole object of which is to act as a balance between the mine and the concentrating mill, providing for short stoppages and irregularity in operation. Should the mill be out of commission for a short time, the mine remains in regular operation filling up the storage pocket, and vice versa.

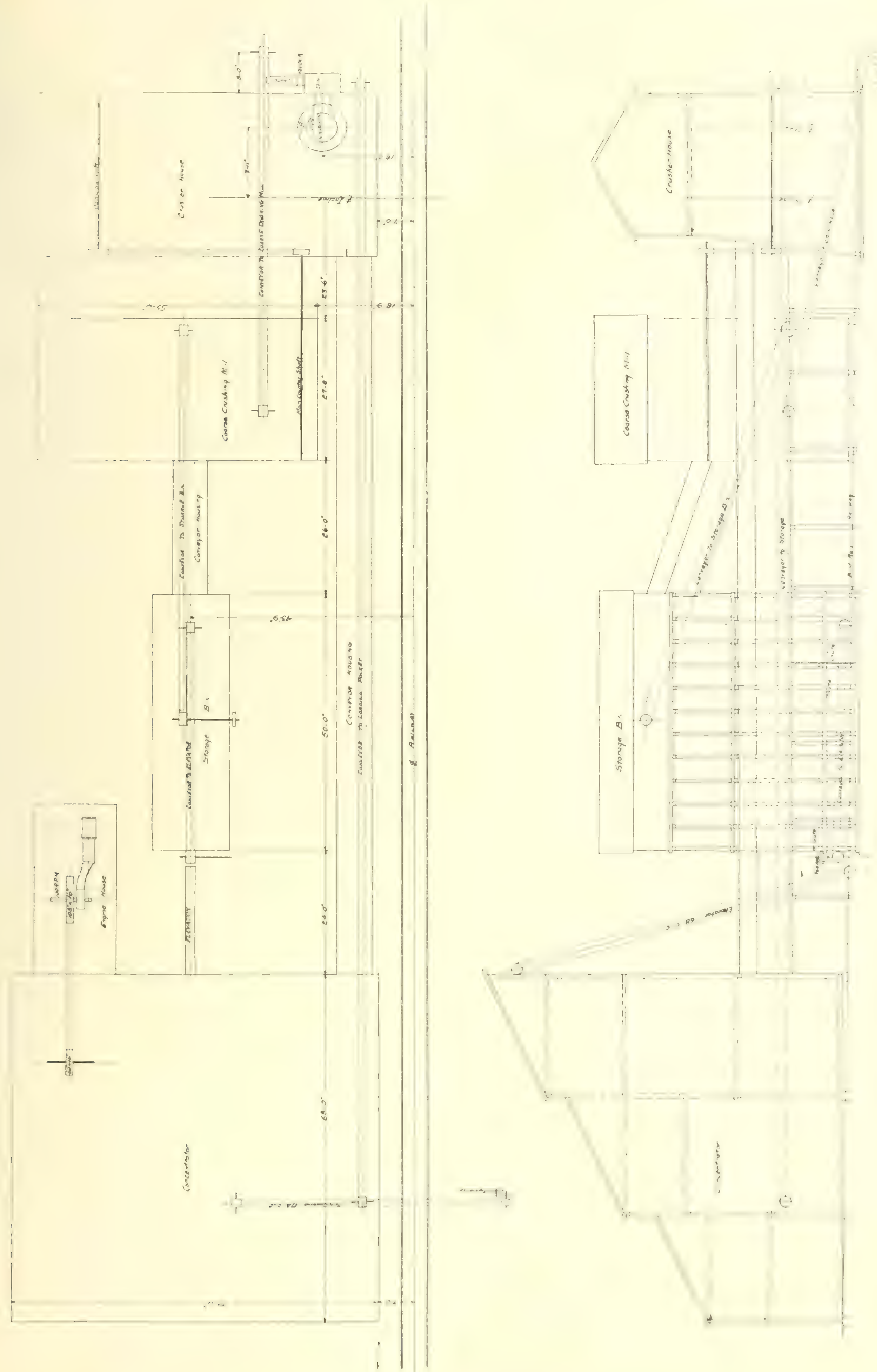
From the storage pocket the ore passes through the concentrating mill, and concentrates discharged either into a 500-ton loading pocket whence it may be loaded direct into cars or passes on to a stock pile. Tailings are conveyed about 150 feet from the mill to a point suitable for a dump pile. Provision is also made to load these taiilngs into cars for ballast for the railroad.

Coarse Crushing Mill.—The crude ore is conveyed from the hopper under the primary crusher on a 24-inch conveyor belt set at an angle of 15 degrees thence discharged at right angles into the boot of a continuous steel bucket elevator which discharges at the top of the biulidng on a small grizzly set to remove fines and muck. Thence through a revolving bull screen 4 ft. diameter, 6 ft. long, with 2-inch round holes. The undersize from this passes directly to a conveyor belt discharging into the storage pocket. The oversize of this screen delivers into a set of Traylor rolls 54-inch diameter, 24-inch face. These are set at 1-inch opening. The product of the rolls is re-elevated in a steel bucket elevator to a second revolving screen 4 ft. diameter, 6 ft. long, with 2-in. round holes, from which any oversize is returned directly to the rolls. In this manner all oversize of a 2-inch round hole is kept in continual circulation until crushed. This is very necessary with this ore on account of its physical tendency to break into large thin slabs, impossible to properly stratify in a jigging concentration process. This crushed ore is now ready for concentration, and delivers to an 18-inch conveyor belt set at an angle of 15 degrees and discharging into the top of the storage pocket.

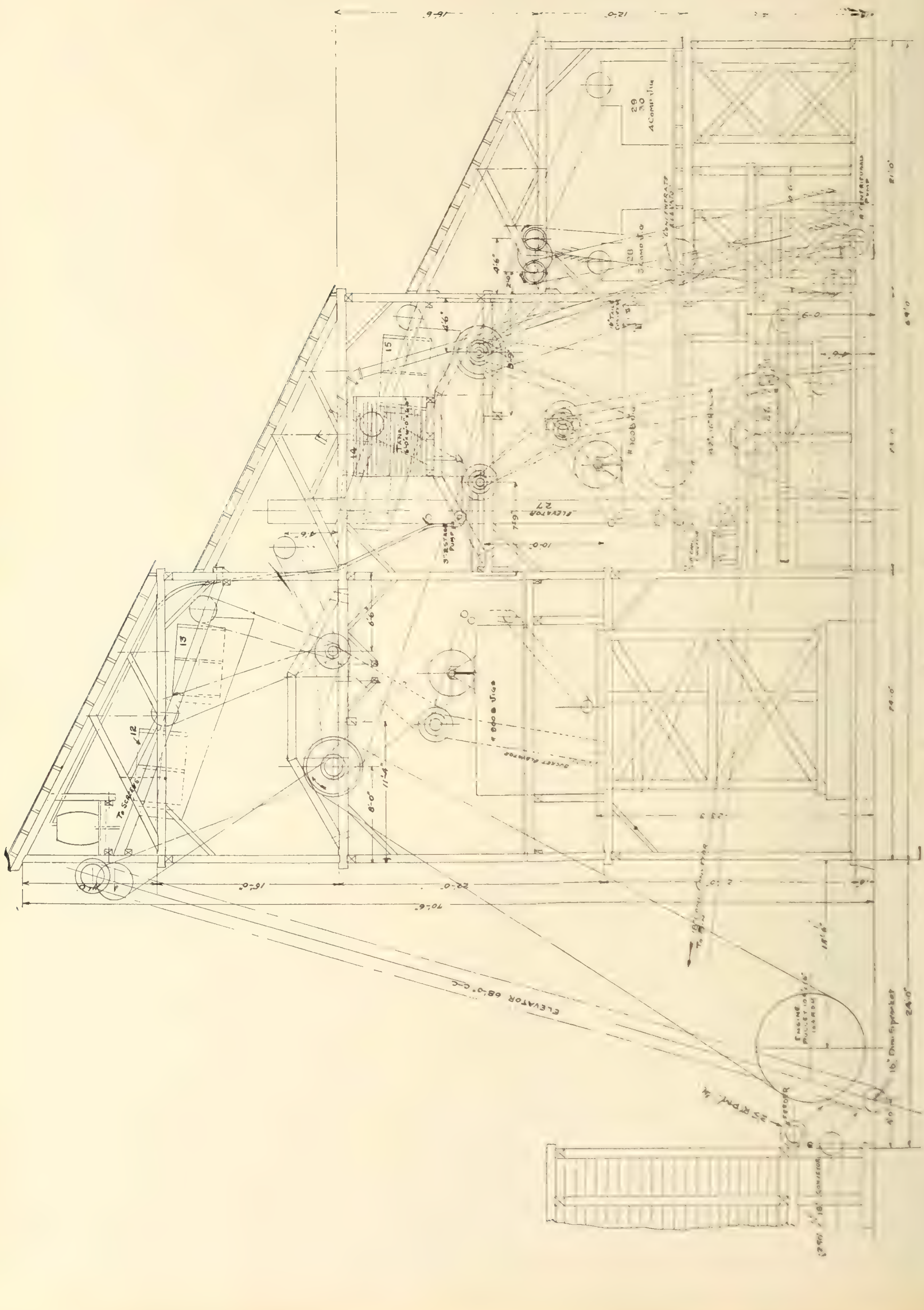
Storage Pocket.—This pocket is a building 50 ft long, 15 ft. wide. The regular draw-off is at the end nearest the mill where the ore passes over a revolving drum feeder into a continuous steel bucket elevator 70 ft. high, which in turn discharges the ore into the top of the mill.

To provide an auxiliary discharge to draw off the pocket, an 18-inch conveyor belt runs underneath fed by several gates in the bottom of the pocket. This belt also discharges into the elevator feeding into the mill.

(To be continued.)



Bathurst General Layout



Bathurst Concentrator Elevation.

SPECIAL CORRESPONDENCE

QUEBEC

Thetford Mines, Que., Sept. 21, 1912.

There has been a marked improvement in the business conditions of the industry, and the almost forgotten spectacle of seeing buyers having difficulty in placing their orders is being recorded among the wonders of the camp. The production this season has fallen about a third short of the estimates, and the prospects are that some of the "fibre producers" will be given a chance to resume operations next spring in order to meet the demands.

The reason of the sudden change in conditions is that the mines were unable to obtain the amount of labour required owing to so many of the working classes leaving the camp owing to the uncertain labour market. Several mines have seen fit to suspend operations during a portion of the past two winters, and the distress caused thereby has caused the better class of labourers to look for some place where they could be assured of work the year round. The injustice to the working men is now acknowledged and the companies are using strenuous means to assure them that operations will in the future work all winter, and no doubt this winter will be the most active for many years past. O, wad some power the giftie gie us to run our business with some sane relation between capital, lobour and production; then the asbestos industry would be what it should be and what it is striving hard to become, one of the most stable and prosperous mining industries in Canada.

Mr. W. H. Smith, for some years superintendent of the Bell asbestos mines and lately resident manager, has been removed to the head office of the company at Ambler, Pa.

Mr. J. D. Sharpe, general manager of the Asbestos Corporation, is shortly expected back from a business trip to England.

A Board of Trade has been recently instituted in Thetford Mines, having for its aim the healthful encouragement and promotion of all which tends to the progress of the industry.

ONTARIO.

COBALT, SOUTH LORRAIN

Those prospectors not obtaining the tin tags which entitled them to temporary possession of the Gillies Limit claims which they coveted, have had to seek new fields. The consequence is that several minor rushes have developed, one into Gauthier township not far from Dane, and another into Auld township on the Montreal River. A gold prospect is now but lightly regarded from a prospector's viewpoint, at least in comparison with silver: he has learnt that there is nothing better than a working option to be obtained and on meagre terms; therefore the cry is all for silver.

The Gillies Limit rush focused the attention of the general public, which knows nothing of mining, on the speculative possibilities of the silver camp, and there is again a very keen demand for anything with a chance to make good. Already the stampede has furnished one arrest for perjury, and it is likely to provide many others. It is quite significant that although a special train was hired it did not land its enterprising band of stampeders on Mr. George Smith's doorstep at Haileybury until that position of advantage was well filled by waiting figures, and the inference is that some of the gentlemen who preceded them must have been in the limit in spirit only or by proxy.

As a comedietta the rush was admirably stage managed; but from the standpoint of justice and fair play it left much to be desired. Take one instance. The tired, jaded men who were lined up in the dawn on the recorder's steps were told by the Provincial police that they would be given a number and that they would be secure if they went home and slept that they could get their places in the line when they came back, and also that their application would be received according to the numbers. When Mr. George Smith came he told them and the waiting crowd that he could not lawfully do that and the rush that broke the windows and jammed the recording office followed. As a result many of those who should have been last were first, and those who should have been first were last. The crowd was marvellously law-abiding and good tempered, or there would most certainly have been much trouble.

The net result of all the fuss and flurry is that many men are now enabled to prospect openly what they have been secretly looking over for years. No startling discoveries have been made as yet; some wide calcite veins with a little galena and copper in them comprise at the time of writing the known bag. But according to location there should be some interesting finds. Probably the most striking fact in the whole affair is that the government is now giving away in small packages what they could have got $20,000,000 for six years ago, when faith was more abundant and the promoter reigned in the land.

The success that the Bailey-Cobalt and the Cobalt Central are encountering in their resuscitation exercises at Diabase Mountain on the Glen Lake shore is waking many hopes that the spark of life still lingers in some of the mines that have been regarded as "floaters" for several years past. Since Mr. Benson, superintendent of the Pullman shops at Chicago, obtained control of the Bailey persistent and intelligent efforts have been made to raise it into the line category. Until a few months ago results had only been good enough to be tantalizing; a small bunch of ore would decoy the manager ahead only to pinch out in a round or two. Now a vein that does not pinch out over night is being followed and some very high garde ore mined. Owing to the lively interest in silver there are some attempts at robbing the graves of their dead. These body-snatchers have not so far been particularly successful in their ghoulish work, but if the price of silver is maintained and the interest in it as active, many corpses that have very properly been buried for the past four or five years may be resurrected.

Mr. Samuel Price, mining commissioner, has conducted his investigation as to the necessity for an eight-hour day among underground miners in Ontario, and has passed on to Sudbury and Michipocote. The Western Federation of Miners is personally urging the bill on the behalf of the union men and both in Porcupine and Cobalt they were strongly represented. The union had matters very much their own way in Porcupine. At the first sitting two mine managers appeared, but they were so manifestly in the minority that for the most part they were spectators. There

was no organized opposition in Porcupine at all, the majority of the mine managers ignoring the investigation altogether.

In Cobalt the case was quite otherwise. The Cobalt Mine Managers' Association presented a closely reasoned argument against the bill signed by agents of twenty-seven mining companies. It is stated that an eight-hour shift would reduce production and dividends by 31 per cent., and would necessitate a 31 per cent. cut in wages. A tabulated statement was presented from the mines hospital of Cobalt that sickness among the men only amounted to 2.2 days per year per man, so that underground mining could hardly be called an unhealthy employment. The mine managers stated that they were in active competition with Mexico and South America where silver could be produced cheaper and that any interference with the existing scale of operations would tend to make capital shy of the country. The statement was read by the commissioner at the opening of the night session at Cobalt and the Western Federation speakers following attacked some of its conclusions. An unusual interest was taken in the investigation both in Porcupine and Cobalt and the meetings were invariably crowded with those who wished to urge the passing of the measure. At both camps there was a unanimous vote for the passing of the measure and enthusiasm was undoubted, but whether the crowd present represented the opinion of the underground miner in the camp is another matter. Mr. Samuel Price made an ideal investigator. He heard all men and urged the fullest discussion. He was patient as long as patience was a virtue, but at Cobalt reproved a pert speaker with such force that he never had any more trouble.

Very interesting is the discovery that the Beaver vein at the 530-foot level holds just as high grade values where it is in the diabase as in the Keewatin. The pay streak is just as high grade and there is far more silver in the wall rock. While it is yet far too early to make any deductions for the future the discovery does tend to break down the uncomfortable theory that in the South Coleman area when the diabase contact was reached the values would disappear or be so patchy that mining would yield relatively poor returns. This theory had gained much strength from the development at the Temiskaming where ore was very much poorer in the diabase than in the Keewatin. If the development is not a freak, the discovery will rank as one of the most important in the Cobalt camp during the year 1912.

The Beaver Consolidated has taken possession of the Elk Lake property it has recently purchased, and the Donaldson is to be equipped at once with a compressor plant and development prosecuted with vigour.

The production of the Cobalt Lake mine is being maintained at a good level. In July it produced 100,000 ounces, and in August 120,000 ounces. The new mill is working satisfactorily. Previously the Cobalt Lake made dissatisfied shareholders and deficits its principal output.

Some conception of the richness of the short shoots of ore in the veins at the Temiskaming mine may be obtained from the car of ore that went out last month. It contained thirty tons and was worth at least $75,000, or sufficient to provide one quarterly dividend.

PORCUPINE AND SWASTIKA

In the absence of any returns from the producing companies in Porcupine the shipments of copper from Dane and nickel from Iroquois Falls is interesting. The Alexo property is maintaining a steady stream of ore from their siding near Iroquois Falls on the T. & N. O. Railway to Victoria Mines, near Sudbury. The ore is being mined most economically and a fair profit can be made. But what is perhaps more important, development is revealing an ore body much larger than could be demonstrated existed before.

The first high grade copper that has perhaps ever been shipped in marketable quantity from Northern Ontario left Dane station last month. The sixty tons of ore was shipped to the United States Metal and Refining Company at Chrome, New Jersey. The Dane Mining Company, formerly known as the McKinnon Syndicate, owns 1,200 acres near Dane and are proceeding deliberately to discover what they have got. The shipment of ore was made more for testing purposes than with the idea of continued production for at the present time the long haul to the station and the bad roads run up costs rather high. The company has let a contract for several thousand feet of diamond drilling on the property and is endeavouring in every way to make a mine of importance. They have as their engineer Mr. G. O. McMurtry, who came direct to Northern Ontario from the copper country at Bisbee, Arizona, where he had been working at the Copper Queen.

The unsubstantial character of the claims of the diamond seekers in Ungava is made more evident by the return of several prospectors from James Bay. James Muir, of Haileybury, has brought back blue clay which he found up there, but no diamonds. He states that the Indians he met told him that there had been no white men in the country for many years. The trip was an arduous one.

While there is silence absolute as to the production of the Porcupine camp, it is known that the Dome, Hollinger and McIntyre are making clean-ups which satisfy the management that their mill practise is correct. The Dome is producing steadily now, treating nearly 400 tons per day, and the Hollinger can see the end of their troubles. The design of the mill at the Hollinger has been a subject to the same severe criticism which assails all matters relating to this company, but the proof of the milling is in the extraction, and there now appears ground to hope that no bad errors have been made in the construction of the plant. In the light of practise at the McIntyre and the Vipond it appears that the mill might have been built at a considerably smaller cost than it actually was, but it is very probable that the features it now contains would have had to be added at a later date when their ore became more refractory. There is a very natural impatience among shareholders to have some figures as to production and it is this lack of knowledge that has probably inspired most of the adverse criticism. It is understood in camp that the Dome and the Hollinger have come to an agreement to publish figures as to production on or about the fifteenth of this month, and from every point of view this course would be very desirable.

Quite a little flurry was caused in the northern section of the Porcupine field by the discovery of native gold in ore at the 150-foot level of the Hughes Porcupine mine. The upper levels had not presented any great encouragement for the future.

The Porcupine Lake is also proceeding with vigour to erect buildings and house plant on the Hunter claims in Golden City and Whitney and Northern Tisdale for the past month very quiet indeed, have become much more active.

It is to be feared that the Schumacher syndicate has lost its mine and rendered useless the work that has so far been completed. The company was cross-cutting from a shaft to the south of the town towards Pearl Lake at the hundred foot level. The day before the accident happened the ground seemed very soft and it was determined to shoot one more round in the morning and abandon the cross-cut. The morning's shots let in the water and the sand and caused a hole in the highway fifteen feet deep by sixty feet wide. Several buildings were undermined.

While work on the second level of the Vipond is revealing an unexpected width of ore in the Davidson vein, developments at the third level have not been so satisfactory. So far no shoots of ore of the grade found at the upper levels have been cut in the development work at the 300 foot level, though as yet little work has been done.

Cobalt, Gowganda and South Lorrain

It is now evident that while the Cobalt mines will make more out of their silver in 1911 or ever before, the production of metal will be less. This conclusion was foreshadowed in the bulletin of the Department of Mines for the first three months of the year, and is confirmed by the record for six months. The production table as it affects the Cobalt camp reads:

Silver, 14,258,403 ounces, value $7,936,600.

Cobalt, cobalt and nickel oxides, 854,324 lbs., value $192,073.

The reduction in the production of the silver district of Northern Ontario for the first six months of 1912 amounted to 973,566 ounces, but owing to the higher prices of silver $292,400 more was received for it. It is very interesting to notice that after years in which the by-products of Cobalt's ores have been a drug on the market, there has been a little quickening of interest and cobalt, and cobalt oxides realized $192,073 for the first six months of this year, or three times the amount obtained last year.

The revised shipments for the month of August, prepared for the T & N. O. Ry., by Mr. A. A. Cole reads:

Last month the Trethewey produced 62,200 ounces of silver, or a little higher than the average run about 60,000 ounces per month. According to Col. A. M. Hay, for the first seven months of the year the net profits were $101,294, or nearly twenty per cent. on the capitalization. The floating assets of the company including cash and ore at the end of July amounted to $127,500. The flow sheet at the mill has been changed so that the production can be raised by 25 per cent. If the company desired this year it could probably wipe out its capitalization as it has already disbursed 84 per cent. in dividends. While the Trethewey has never gone on a quarterly basis it has usually paid 20 per cent. per year. It has already paid ten per cent., and will probably make another disbursement of the same size in the fall.

All the expeditions to Ungava, Baffin's Bay, and the East Coast of Hudson's Bay have failed. The two most ambitious undertakings have just returned. "Lucky" Scott and his crew which include two members of the Holland family, have just reported from Newfoundland. They found no trace of gold and believe that it is a myth. But they did bring back with them some fur and other "trade." The other expedition was even more unfortunate. The ship commissioned by Captain Munn for some English interests and sailed by Captain Bartlett was crushed in an ice jam and the members of the party were very lucky to be saved by "Lucky" Scott's party. As the New York party took with them a moving picture operator it is probable that the films may prove a little salvage from the venture.

Most of the prospectors who adventured to the east coast of Hudson's Bay in search of the diamonds which a man named Grant is reported to have found have returned with no intention of going back next year. They report that the distances are so vast that even if they believed there was anything there it would take years to locate it. One Haileybury man got within 400 miles of the spot where some Indians said Grant had said he had found some diamonds, and another man exhibited clay which might have contained diamonds if it had been in the Transvaal. But that is all. It will be very interesting to learn how Mr. Robert Flaherty fared when he returns this winter. For Sir William Mackenzie and his associates Mr. Flaherty has been on the shores of Hudson's Bay for eighteen months, and he will certainly have covered a great deal of ground. He is returning to Canada via England, and will probably not be seen here much before Christmas. He was well and properly equipped for the expedition and knew his ground well, so that he has a much better chance of success than many of the expeditions that left late in the spring from Northern Ontario.

The Ontario Government has given notice that no more work must be done on disputed claims in the Gillies Limit, or rather that no more work must be done on the discoveries which the contestants believe will establish their right to the claim. They can if they like prospect on another part of the claim and endeavour to make another part of the claim and twenty-five claims still under dispute. Many of the stakers have agreed among themselves believing it is better to compromise with your opponent than to subject the matter to law's delays and lawyers fees. There have been no startling discoveries in the Limit and most of the prospectors who took part in the stampede have sought fresh fields. One of these is in Auld Township half way between Elk Lake and Latchford on the Montreal River. Here a narrow vein of calcite showing native silver has been uncovered, and there has been some staking. There was also a mild stampede into Gauthier Township in the Larder Lake mining division. Three Haileybury Frenchmen have discovered some native gold in a quartz vein there.

The Tongue claims near Hubert Lake in the Elk Lake section have been sold to a Toronto syndicate who have already begun to develop them. The owners of the claims were Dr. C. W. Haentschel, of Haileybury, and Sam Tongue, of Mattawa. Mr. A. P. Seymour, formerly manager of the Cobalt Lake mine, is superintendent for the purchasers.

The excellent results that have lately been obtained on the Bailey and old Cobalt Central, at Cobalt, has determined the Alexandra Mining Company, which holds the next property, to re-open their mine.

Work on the Foster has as yet been confined to the surface. Mr. T. J. Flynn, who is in charge for the leasing syndicate, is making a study of the conditions in the Kerr Lake section before he does any underground work.

Porcupine, Swastika and Larder Lake

The returns furnished by the department of mines for the first six months of 1912 give some very reassuring statistics as to the manner in which the Porcupine

camp is making good. During that time the Province of Ontario produced 11,854 ounces of gold worth $235,198, a very puny sum no doubt in comparison with the millions of Cobalt, but nevertheless $192,878 more than last year. For this increase the Dome mine of Porcupine is responsible to a very large degree. The Dome mine first dropped stamps at the end of March, but the accident to the tube mills prevented any steady practise till the end of May. It will be seen, therefore, that Porcupine was but just getting into its stride at the end of June. The Hollinger mill did not crush ore until the end of June, and for several months the troubles that invariably await the trying out a new plant cut off production. Now it is learned on definite, but not official information that during the month of August, the Hollinger produced $200,000 with but thirty stamps dropping. The mill is now running quite smoothly, and there is little doubt but that that rate of production can be maintained and when the ten other stamps are added, accelerated. It is also understood that in the first week in September the Dome produced almost $50,000.

The Dane Mining Company has made its first shipment of high grade ore. This first shipment of ore went to a New Jersey smelter. The Montreal syndicate controlling the company have purchased a large acreage round the mine, and evidently intends to build up a property if the ore is there. For the first time in the history of the camp a Cobalt company was paid for copper as a by-product. The ore came from the bottom levels of the Temiskaming mine. To-day Northern Ontario is shipping and producing gold, silver, copper and nickel.

The Schumacher syndicate sustained a severe loss when the drift caved in and the waters of Pearl Lake followed. A cross cut was being driven from a shaft south of the town to Pearl Lake at the 100 foot level. The night shift had found the ground soft and it was determined to put off one more shot. That round of holes was fatal for it broke through the rock into the sand and the drift being below water level Pearl Lake followed, and the mine was lost. Traffic along the highway between South Porcupine, Schumacher and Timmins was held up until the hole had been filled in.

At the third level of the McIntyre mine the ore has undergone a decided change. In the face for a width of 26 feet there is little visible gold, but the rock is heavy with fine sulphides. The management claims that at this point the ore averages $16 per ton right across the face.

BRITISH COLUMBIA.

Another dividend of $2\frac{1}{2}$ cents a share on its 2,000,000 shares—total amount of this distribution, $50,000—was paid by the Standard Silver-Lead Mining Company on August 9. This brings the aggregate of dividends paid in five consecutive months up to $225,000.

The gross value of metals produced at the smeltery of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, West Kootenay, during the fiscal year ended June 30, last, was approximately $5,083,000, and of this the proportion in gold was 52.3 per cent. This total compares with that of $4,437,901 for the year ended June 30, 1911. Earlier corresponding periods showed totals as follows: June 30, 1910, $5,911,767; June 30, 1909, $5,505,526.

The discovery of placer-gold, stated to be in paying quantities, was reported from Kamloops late in August. The locality is given as Louis Creek, about 30 miles north of Kamloops. The creek is described as being a tributary of the North Thompson River, coming in from the east. Bed rock is said to be only six feet from the surface in one claim bottomed. The entire creek has been staked, so outsiders are likely to have a fruitless journey if they go there with the expectation of finding unstaked ground.

Mining Near Nelson.

Kootenay Gold Mines, Ltd.—The Kootenay Gold Mines, Ltd., continues to mine and mill gold ore form its Granite-Poorman group of mines, situated a few miles west of Nelson. This property has been worked for years, mining from 10,000 to 12,000 tons of ore each year. The brief particulars of its operations in 1911, as printed in the recently published "Annual Reports of the Minister of Mines" for that year, are as under:

"The Granite-Poorman, on Eagle Creek, operated its 20-stamp mill continuously. An addition to the mill, 36 by 70 ft., was built, and in this is a plant for the treatment of iridium and palladium—stated by Mr. A. Gordon French to be contained in the ore—and which is just ready to be put in operation. A new sorting house was built at the No. 4 Poorman tunnel to facilitate sorting the waste from the ore. The development work during the year has greatly added to the reserves of the property. In the No. 4 Poorman tunnel a vein called the 'Hardscrabble,' that had been crossed when the tunnel was driven, was drifted on for 432 feet, and a raise put up 90 feet. This opened an oreshoot for 300 ft., showing from 6 in. to 3 ft. of ore, 8 ft. being the width of the vein at present, which is at a depth of 200 feet below the surface. As this is a parallel vein to the old Poorman vein, it adds greatly to the life and value of the property. There was also done during the year 197 ft. of cross-cutting in the White, 145 ft. of cross-cutting and 375 ft. of raising in the Greenhorn, and 315 ft. of drifting and 354 ft. of raising in the No. 5 level of the Poorman."

Last month it was ascertained from the manager that during 1912 there has been driven some 600 ft. on the Hardscrabble vein, and ore has been stoped from this vein. The average width of good ore has been about 2 ft., there is approximately 550 ft. of backs above, so much more ore should be obtained from this vein. The ore ranges in gold content up to a value of $20 a ton, but as much barren rock has to be broken down with the ore, the average value is reduced, and consequently the mill feed runs but $7 to $8 a ton. Dikes cutting the vein cause much trouble, but usually ore containing a higher value in gold is found near the dikes.

Perrier Group.—Work is being continued on the Perrier group, distant from Nelson about three miles, along the Great Northern railway southward to Spokane. The main lead has been opened in several places on the surface. Further sinking has been done, and now a cross-cut is being driven to intersect another lead.

The plant is being added to; a small crusher is being put in, also a Triumph vanner. That previously installed includes a small compressor and a Huntington mill. The ore contains gold; it is intended to shortly begin concentrating it. A trial run was made lately with the Huntington mill, and from 700 lbs. of ore gold to the value of nearly $40 was obtained. Ordinarily, though, the value of the gold content is about $20 a ton. Not much ore has yet been shipped; some time ago 19 tons was sent out to ascertain its value in bulk. This property is owned by Nelson men.

Granby Co. Prospecting Bonanza Group.

On August 1 there was printed in The Canadian Mining Journal the report of Mr. Donald G. Forbes, made for the Provincial Department of Mines, on the Granby Company's Hidden Creek mines near Granby Bay (formerly known as Goose Bay), which account of that important property was reprinted from the "Annual Report of the Minister of Mines for British Columbia, 1911." The following information concerning another group of mineral claims situated in the vicinity of the Hidden Creek group, to which the Granby Company is giving attention, was obtained recently from Mr. Jay P. Graves, vice-president and general manager of the company, when the writer was in Spokane, Washington:

In addition to the large amount of development work the Granby Company is doing in its Hidden Creek mines, and the extensive surface improvements it is making in connection with those mines and the copper smeltery it is intended to establish at Granby Bay, the Bonanza group of mineral claims is being prospected by the company.

The Bonanza group consists of twelve full and fractional claims. Part of this property is within one mile of the Granby Company's smeltery site, and the group extends clear down to tidewater. The company holds these claims under option of purchase from H. Doyle and associate owners. The purchase price is $70,000, and under the terms of the option, the company has one year within which to explore the property and decide whether or not it will purchase it. The agreement also stipulates that not less than $1,000 a month shall be spent in development work while the option shall hold good. The ore showings are stated to be strong, and similar in appearance at the surface to some of those on the Hidden Creek group. As the character of the ore deposits appears to be like that of those in adjacent mines, it is expected the formation and conditions generally will also be found to be similar. Diamond drilling has been commenced, and the first 20 feet of core gave assay returns of from two to three and one-half per cent. copper. Ore from open cuts ranges from three to five per cent., and even up to as high as nine per cent. copper. It may be added that it is understood present indications are favourable for the property proving under development good enough for the company to purchase, in which case its holdings in the vicinity of Granby Bay will be considerably increased in area.

British Columbia Copper Co.'s Operations

When at Greenwood in July the writer was informed that during the expired six month sof 1912 the British Columbia Copper Company had treated at its smeltery there 302,747 tons of ore from its own mines in the district tributary to Greenwood, and had produced 5,362,226 lbs, of blister copper. This compares with a tonnage for the whole of the fiscal year ended November 30, 1911—twelve months as against six in the current year—of 598,758 tons of ore smelted and 10,044,093 lbs. of blister copper produced, so that the proportionate production for this year shows a satisfactory increase, both in quantity of ore smelted and blister copper made.

This company is also operating in Vogt's camp, near Princeton, Similkameen, where it is exploring several mineral claims of a large group held under option of purchase. The energy with which the work of exploitation is being conducted will be indicated by mention of the fact that five diamond drills are being used in prospecting these claims, in addition to much ordinary development work being done in endeavours to determine the approximate quantity and metal contents of the ore in the ground being explored.

In Boundary district, the company's largest mining operations are being conducted at its Mother Lode mine, near Greenwood, and the Rawhide mine in Phoenix camp. The latter is owned by the New Dominion Copper Company, a controlling interest in the shares of which is owned by the British Columbia Copper Company. Officials of the latter company also direct the work being done at the Rawhide mine. The Lone Star and Napoleon mines, in the neighbouring State of Washington are both owned and operated by the British Columbia Copper Company; ore from these mines is being received at the company's smeltery at Greenwood. In the company's last fiscal year the Napoleon shipped more than 14,000 tons of sulphide ore for use as a sulphur flux, while the Lone Star shipped only a little more than 3,000 tons, its ore being of a refractory nature and so less suitable for low-cost smelting. The current year's smeltery receipts to date from these mines show totals of approximately 6,000 tons from the Napoleon, and 3,000 tons from the Lone Star.

Other mines being worked by this company are the L. H.—a gold ore property situated a few miles from Silverton, Slocan Lake—and the Eureka copper mine, in Nelson mining division. It was reported recently at Silverton that the L. H. is developing encouragingly, so that it is hoped the company will take up its option on the group, but no information had been received that can be regarded as reliable. As to the Eureka group—it is stated that the purchase price named in the bond on this property is $50,000, and that in the past approximately 2,000 tons of ore has been shipped from the mine. The average metal contents of the ore shipped have been reported in newspapers, as follows: Copper 5.5 per cent., and silver 2.1 oz., and gold 0.21 oz. per ton. Machinery and plant from the company's Wellington group mine, recently closed, has been shipped to Nelson for use at the Eureka.

It is noteworthy that some weeks ago announcement was made in New York that the company was making profits at the estimated rate of about $750,000 a year. On August 24 the Boston Commercial printed the following news item: "The British Columbia Copper Company's metal production for the first ten days in August was the largest in the history of the company. Earnings as published for July do not include the income from its New Dominion Copper Company investment. Including these, the total is more than double its dividend requirements."

Mr. Chas. Camsell in Similkameen.

The Hedley Gazette of August 29, includes the following in its mining news: "Mr. Chas. Camsell, of the Geological Survey of Canada, came to Hedley on the 26th inst. from Tulameen and Princeton, and expects to put in about a fortnight in this vicinity, looking over the camp and keeping his data thereon strictly up to date, as well as making further investigations. He has spent a busy summer going over the route mapped out for the excursion next summer of the visiting geologists from other lands, and the members of the International Geological Congress who will be shown over the route by him will be fortunate in the guide whose services will be at their disposal. He has finished most of his maps and guide books and sent them in to the department, Ottawa.

"Mr. Camsell has been on Copper Mountain, near Princeton, where development is in progress. Before going there he spent a couple of days in the platinum belt on the Tulameen with the representatives of two large concerns. These were Mr. J. E. Colby, of the firm of Baker & Co., paltinum dealers, of New York; and Mr. A. B. Coussmaker, representing Johnson Matthey & Co., of Hatton Gardens, London, England, the largest platinum dealers in the world. The world's supply of platinum in sight is diminishing year by year, while the demand is constantly increasing, so it is now up to mining men to discover new platinum fields. This situation may lead to an extensive exploration of the platinum-bearing gravels on the Tulameen River.

"Messrs. Selby and Coussmaker were fortunate in having Mr. Camsell go over the field with them and explain the geology of the district, which he has so carefully worked out."

COMPANY REPORTS.

NEW DOMINION COPPER COMPANY, LIMITED.

The report of the New Dominion Copper Company, Limited, for the fiscal year ended March 31, last, shows total shipments of ore during the year amounting to 179,605 tons. Four series of shipments were made to the British Columbia Copper Company's smeltery at Greenwood under various rates for smelting. The existing rate on April 1, 1911, was upon the basis of the New Dominion Copper Company paying the actual smelting cost of the British Columbia Copper Company, plus 50 cents a ton.

Owing to the strike of the coal miners in the Crow's Nest Pass coal district and the importation of Connellsville, Pennsylvania, coke by the British Columbia Copper Company, the smelting costs of that company were increased and a new arrangement for the smelting of the New Dominion Copper Company's ore was accordingly made. This arrangement was put into effect on June 1, 1911, and was, in substance, a minimum royalty of 20 cents a ton to be paid to the New Dominion Copper Company by the British Columbia Copper Company, after calculating ore returns on the basis of the previous arrangement.

The grade of ore, combined with the increase in smelting costs due to use of Pennsylvania coke, and the decreasing price of copper, did not allow of any royalty being paid beyond this. Subsequent to July 1 the ore has been smelted on a new basis, arrived at by a committee of impartial engineers representing the respective interests concerned, these engineers having fixed a definite smelting rate and slag deductions. Apart from this the British Columbia Copper Company guarantees to the New Dominion Copper Company a fixed profit of 15 cents a ton, regardless of whether or not such amount is realized from the ores.

The balance sheet as of March 31, 1912, follows:

Assets.

Mines, smeltery and other properties	$1,311,891
Inventories and ore in transit	26,059
Unexpired insurance	701
Accounts receivable	91,125
Cash in banks	114,579
Profit and loss account	149,102
Total	1,693,457

Liabilities.

Capital stock	$1,178,320
Income bonds	491,725
Accounts payable	15,778
Reserve	7,634
Total	1,693,457

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

While this week's ore shipments show a slight falling off from the average, the bullion shipments are much greater than usual. The Nipissing sent a large consignment of 102 bars of silver to England, and the Drummond appeared again in the list of bullion shippers after a lengthy absence. Practically all of the bullion shipped by the Dominion Reduction Company came from Kerr Lake ore. Following are the ore shipments in pounds for week ending September 21, graded:

Trethewey, 1h.	55,300
Buffalo, 2h.	121,651
Cobalt Townsite, 1h.	93,300
Cobalt Lake, 2h.	153,480
O'Brien, 1h.	65,973
La Rose, 1h.	89,477
Nipissing, 1l.	64,110
Chambers-Ferland, 1l.	64,000
Temiskaming, 1h.	56,063
Total	765,354

The shipments for the week and for the year to date in tons are as follows:

	Week Ending Sept. 21.	Year to date.
Beaver	....	244.26
Buffalo	60.82	864.57
Casey Cobalt	....	212.15
City of Cobalt	....	887.99
Cobalt Lake	76.74	663.65
Cobalt Townsite	47.74	1,254.68
Chambers-Ferland	32.00	321.05
Coniagas	....	1,515.41
Crown Reserve	....	351.10
Drummond	....	330.30
Hudson Bay	....	538.47
Kerr Lake	....	529.92
La Rose	44.73	2,537.23
Lost and Found	....	15.00
McKinley-Darragh	....	1,919.88
Nipissing	32.05	1,630.72
O'Brien	32.98	453.31
Penn-Canadian	....	29.70
Provincial	....	22.22
Right of Way	....	242.82
Temiskaming	28.03	797.01
Trethewey	27.65	381.54
Wettlaufer		265.74
Colonial	....	63.14
Totals	382.65	16,111.90

The week's shipments of bullion were:

	Ounces.	Value
Crown Reserve	8,529.00	$5,200.00
Dom. Red. Co.	11,902.08	7,435.76
Buffalo	14,077.00	8,500.00
Nipissing	114,131.01	72,336.29
Trethewey	10,943.00	6,784.00
Drummond	1,066.08	672.00
Totals	160,648.17	$100,928.05

The bullion shipments from the camp to date for the present year are:

	Ounces.	Value.
Nipissing	2,715,460.69	$1,618,230.62
Crown Reserve	298,801.26	163,271.94
Temiskaming	38,782.00	23,165.10
O'Brien	146,049.33	86,055.39
Nova Scotia	49,010.00	31,800.00
Buffalo	82,157.00	48,914.54
McKin.-Darr.	80,327.00	6,069.37
Kerr Lake	19,223.70	11,678.95
Trethewey	20,637.08	12,416.16
City of Cobalt	4,285.94	2,267.20
Colonial	1,698.00	1,018.00
La Rose	41,189.00	22,975.00
Wettlaufer	3,280.62	2,003.14
Cobalt Lake	5,256.88	2,989.75
Right of Way	505.50	273.00
Cobalt Townsite	2,984.50	1,790.00
Drummond	2,542.90	1,558.00
Casey Cobalt	940.00	574.00
Dom. Ded. Co.	64,306.06	40,296.03
Miscellaneous	16,672.56	11,050.14
Totals	3,594,201.49	$2,145,662.39

BRITISH COLUMBIA ORE SHIPMENTS.

Ore production in the Kootenay and Boundary districts for week ending September 14 totalled 47,062 tons. For the year to date the figure is 1,711,474 tons. Smelter receipts for the week were 41,847 tons, and for the year to date, 1,557,731 tons. Ore production in detail:

Boundary.

	Week.	Year.
Granby	24,049	879,090
Mother Lode	6,241	265,065
Napoleon	342	6,878
Rawhide	6,012	164,557
Unnamed	340	9,156
Nickle Plate, milled	1,500	54,000
Knob Hill	62	1,610
Other mines	....	22,152
Total	38,546	1,402,508

East Kootenay.

Monarch, milled	425	7,300
Sullivan	497	21,927
Other mines	....	740
Total	922	29,967

Slocan and Ainsworth.

Standard, milled	400	12,400
Van-Roi, milled	1,100	42,600
Bluebell, milled	200	1,700
Bluebell	210	908
Standard	148	1,142
Richmond-Eureka	72	1,019
No. 1	24	554
Other mines	....	9,581
Total	2,154	74,904

Rossland.

Centre Star	2,902	111,488
Le Roi No. 2	563	17,981
Le Roi	115	32,220
Inland Empire, milled	90	990
Le Roi No. 2, milled	300	5,900
Other mines	....	237
Total	3,970	168,816

Nelson.

Granite-Poorman, milled	250	10,100
Mother Lode, milled	350	5,200
Queen, milled	300	9,000
Molly Gibson, milled	300	4,800
Molly Gibson	162	806
Hudson Bay	74	337
Granite-Poorman	34	253
Other mines	....	4,783
Total	1,470	35,279

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	24,049	879,090

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	6,241	265,065
Napoleon	342	6,878
Rawhide	6,012	164,557
Unnamed	340	9,156
Other mines	....	17,003
Total	12,935	462,659

Consolidated Co.'s Receipts.

Trail, B.C.

Centre Star	2,902	111,488
Le Roi No. 2	563	17,981
Sullivan	497	21,927
Molly Gibson	162	1,806
Bluebell	210	908
Standard	148	6,144
Le Roi	115	32,220
Hudson Bay	74	337
Richmond-Eureka	72	1,019
Knob Hill	62	1,610
Granite-Poorman	34	253
No. 1	24	554
Other mines	....	19,726
Total	4,863	215,973

COBALT BULLION.

The bullion shipments total nearly 98,000 ounces for the week ending September 14, with four shipments made, the Nipissing leading. They are:

	Ounces.	Value.
Nipissing	72,739.00	$46,094.96
Dom. Red. Co.	15,169.46	9,253.37
Temiskaming	4,700.00	2,989.50
Miscellaneous	350.00	213.50
Totals	92,958.46	$58,501.33

SHARE MARKET.

(Courtesy of J. P. Bickell & Co.)

New York Curb.

	Sept. 24. Bid.	Ask.
Braden	$7.12½	$7.25
B. C. Copper	5.00	5.12½
Giroux	5.12½	5.37½
Greene Cananea	9.62½	9.87½
Inspiration	19.00	19.50
Yukon Gold	3.37½	3.62½
Goldfield Con.	2.87½	3.00
Nevada Hills	1.62½	1.87½
Miami	29.87½	30.00
Tonopah Mining	6.62½	6.75
Ray Con.	23.87½	24.12½
Chino	44.00	44.50
United Copper	1.00	2.00

Cobalt Stocks.

Bailey	.5	.5⅛
Beaver Con.	.36½	.37½
Buffalo	1.50	1.52
Chambers-Ferland	.18½	.20
City of Cobalt	.26	.27
Cobalt Lake	.35	.36½
Coniagas	7.40	7.60
Crown Reserve	3.35	3.50
Great Northern	.5	.7
Gifford	.5	.5¾
Green-Meehan	..	.1
Hargraves	.4½	.5
Kerr Lake	2.85	3.00 ex div
La Rose	2.55	2.65
McKinley Darragh	1.94	1.95
Nipissing	8.40	8.60
Ophir	.6	.8
Otisse	.2	.3
Peterson Lake	.7¾	.8
Rochester	.2½	.3
Right of Way	.6	.6½
Silver Leaf	.3½	.4
Silver Queen	.7	.7½
Temiskaming	.39	.40
Wettlaufer	.42	.44

Porcupine Stocks

Apex	.1	.2
Dobie	..	.25
Crown Charter	.4¼	.4¾
Dome Ext.	.9½	.10
Eldorado	..	.1
Foley-O'Brien	.14	.19
Hollinger	12.45	12.60
Jupiter	.24¾	.25¼
N. Ont. Exp.	1.50	2.00
Pearl Lake	.19	.21
Porcupine Imperial	.2½	.3
Porcupine Tisdale	.1	.2
Preston East Dome	.2½	.3
Rea Mines	.25	.27
Standard	.½	.1
Swastika	.7⅞	.8¼
Vipond	.24¼	.25
United Porcupine	..	.1
West Dome	.8	.15

Sundry.

Canadian Marconi	5.25	5.50
American Marconi	8.25	8.50
Island Smelters	.1½	.2

TORONTO MARKETS.

Sept. 24 (Quotations from Canada Metal Co., Toronto):
- Spelter, 6.50 cents per lb.
- Lead, 6¼ cents per lb.
- Antimony, 9 cents per lb.
- Tin, 52 cents per lb.
- Copper, casting, 18½ cents per lb.
- Electrolytic, 18½ cents per lb.
- Ingot brass, 11 to 15 cents per lb.

Sept. 24.—Pig iron (Quotations from Drummond, McColl & Co., Toronto):
- Summerlee No. 2, $23.50 (f.o.b. Toronto).
- Midland No. 1, $20.50 to $21.50 (f.o.b. Toronto).
- Midland No. 2, $20.50 to $21.50 (f.o.b. Toronto.

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.

Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Sept. 20.—Connellsville Coke (f.o.b. ovens).
- Furnace Coke, prompt, $2.50 per ton.
- Foundry Coke, prompt, $2.75 to $2.90 per ton.

Sept. 20.—Tin, Straits, 50.10 cents.
- Copper, Prime Lake, 17.65 to 17.75 cents.
- Electrolytic, Copper, 17.65 to 17.75 cents.
- Copper Wire, 19.00 cents.
- Lead, 5.10 cents.
- Spelter, 7.65 cents.
- Sheet zinc (f.o.b. smelter), 8.90 cents.
- Antimony, Cookson's, 8.75 cents.
- Aluminium, 24.50 to 25.00 cents.
- Nickel, 45.00 cents.
- Platinum, ordinary, $45.50 per ounce.
- Platinum, hard, $48.00 per ounce.
- Bismuth, $2.00 to $2.25 per lb.
- Quicksilver, $42.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
Aug. 24	62¼	28[illegible]
" 26	62	28[illegible]
" 27	61⅝	28[illegible]
" 28	61¾	28 5/16
" 29	62⅜	28[illegible]
" 30	62⅝	28[illegible]
" 31	[illegible]	[illegible]
Sept. 2		28[illegible]
" 3	62¾	28[illegible]
" 4	62¾	28[illegible]
" 5	62¾	28⅞
" 6	62⅝	28⅞
" 7	62⅝	28⅞
" 9	62½	28[illegible]
" 10	62½	28[illegible]
" 11	62½	28[illegible]
" 12	62¾	28[illegible]
" 13	62½	28⅞
" 14	63	29 1/16
" 16	63	29 1/16
" 17	63¼	29[illegible]
" 18	63¼	29[illegible]
" 19	63¼	29⅛
" 20	63¼	29[illegible]

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

Dominion of Canada.

Ontario

Astley, J. W.
Bewick, Moreing & Co.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Hore, R. E.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Miles, A. D.
Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
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PUBLICATIONS

The Geological Survey has published maps and reports dealing with a large part of Canada, with many local areas and special subjects.

A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the Precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

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1085. Descriptive Sketch of the Geology and Economic Minerals of Canada. Accompanied by a geological and mineral map of Canada, by G. A. Young and R. W. Brock.

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1110. Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec, by W. J. Wilson, accompanied by a map.

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NORTH WEST PROVINCES

1204. Memoir No. 24. Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele.
1211. Memoir No. 27. Report of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, 1911.

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940. Report on Graham Island, B.C., by R. W. Ells. (Reprint.)

YUKON and NORTH WEST TERRITORIES

1080. Report on a part of the North West Territories drained by the Winisk and Attawapiskat Rivers, by Wm. McInnes.
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1133. Map 13A. Kingsport sheet, Nova Scotia, No. 84. Scale 1 mile to 1 inch.

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1181. Map 35A. Reconnaissance Map of Parts of Albert and Westmorland Counties, N.B. Geology and topography. Scale 1 mile to 1 inch.

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1112. Map 12A. Vicinity of the Trancontinental Railway, Abitibi District, Quebec. Scale 4 miles to 1 inch.

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964. Geological map of portions of the districts of Algoma and Thunder Bay, Ontario. Scale 8 miles to 1 inch. Second edition.

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1132. Map No. 7A. Bighorn Coal Area, Alberta, by G. Malloch. Scale 2 miles to 1 inch.

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792. West Kootenay sheet, B.C. Geological. Scale 4 miles to 1 inch.
1123. Map 17A. Southern Vancouver Island, British Columbia. Scale 6 miles to 1 inch.
1167. Map 29A. Mother Lode and Sunset Mines, Deadwood, B.C., Topographical. Scale 400 feet to 1 inch.
1147. Map 19A. Lardeau, West Kootenay, B.C. Topographical scale 4 miles to 1 inch. Contour interval 500 feet.
1197. Map 47A. Law's Mining Camp near Tulameen, B.C. Geological. Scale 600 feet to 1 inch. Contour interval 50 feet.
1219. Map 54A. Nanaimo Coal Area, Vancouver Island, B.C. Scale 1½ miles to 1 inch. Contour interval 100 feet.
1182. Map 36A. Beaverdell, Yale District, B.C. Topographical. Scale 1 mile to 1 inch.

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of 10 cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be mailed O.H.M.S. free of postage.

Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.

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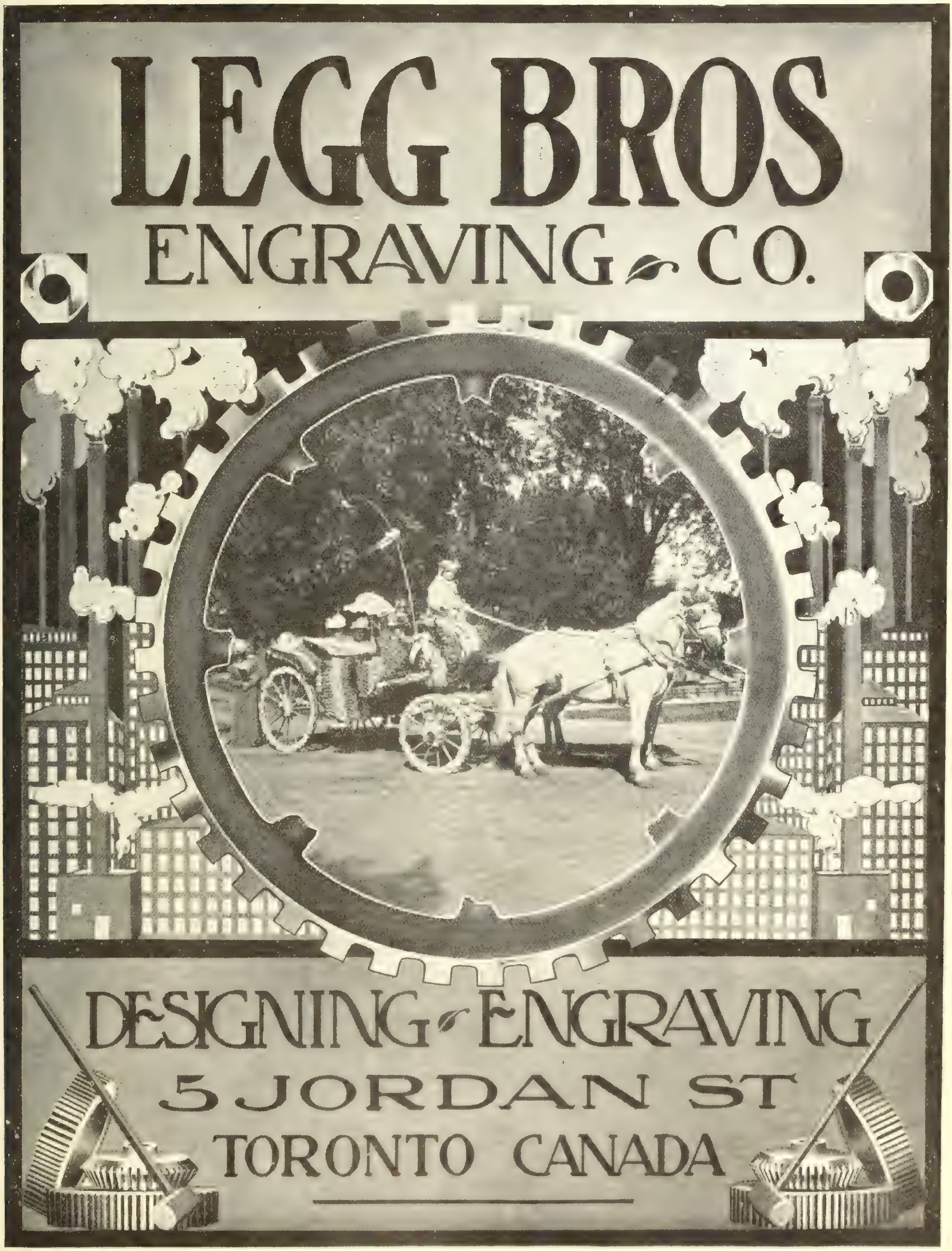
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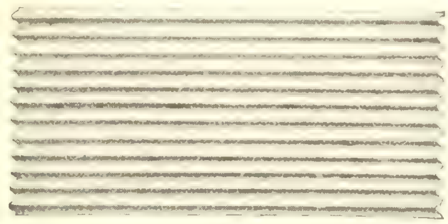

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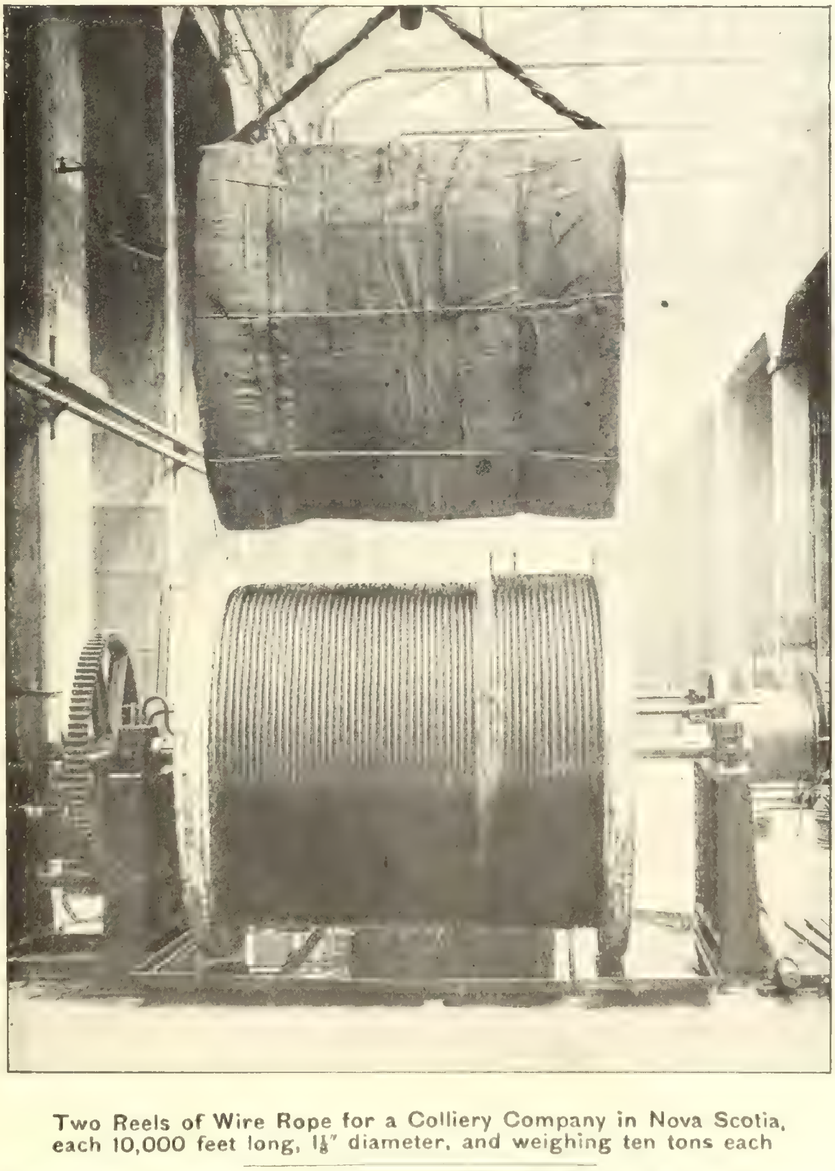

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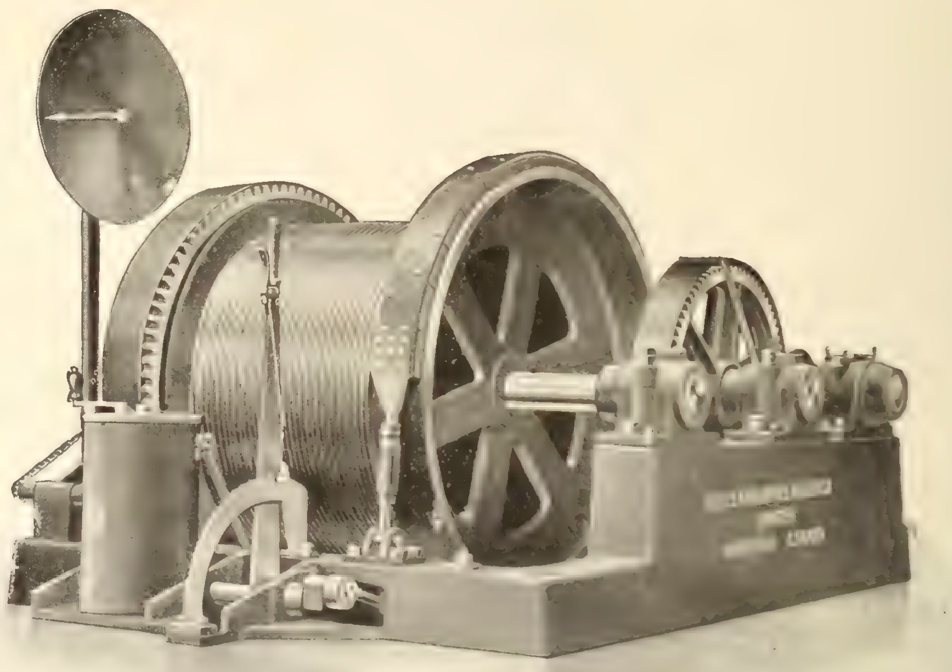

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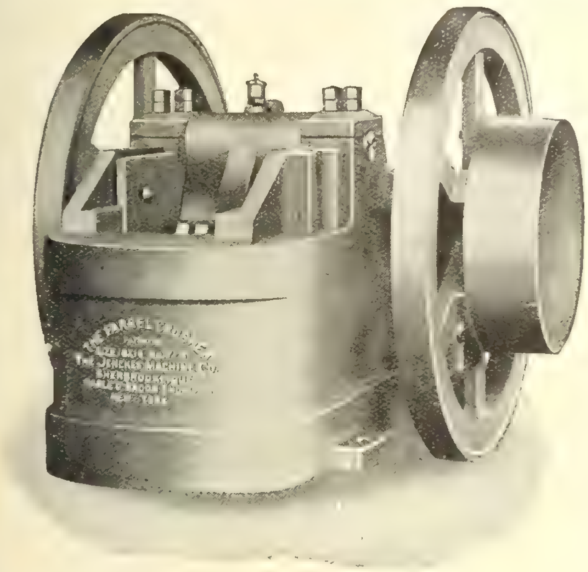

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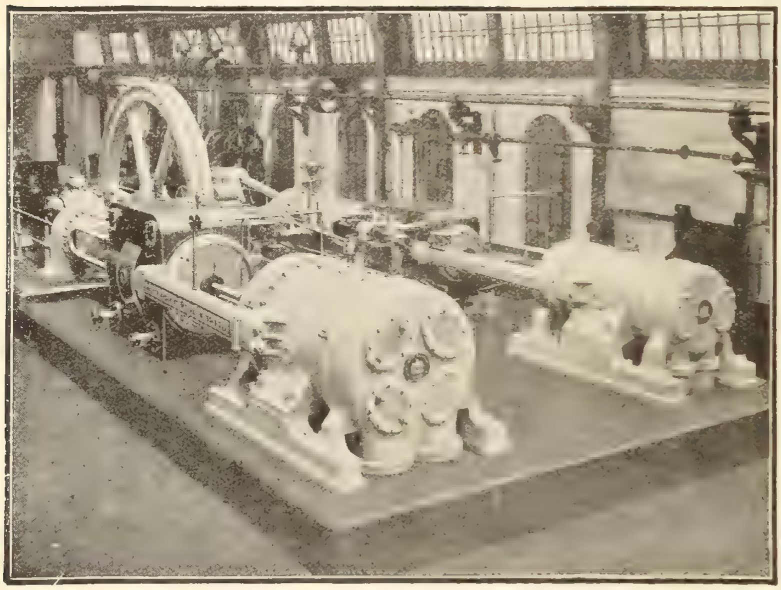

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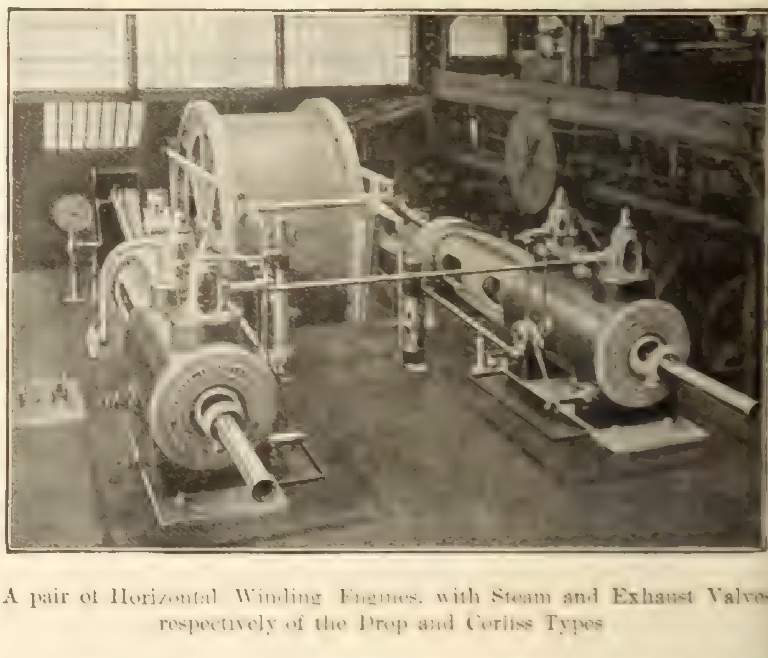

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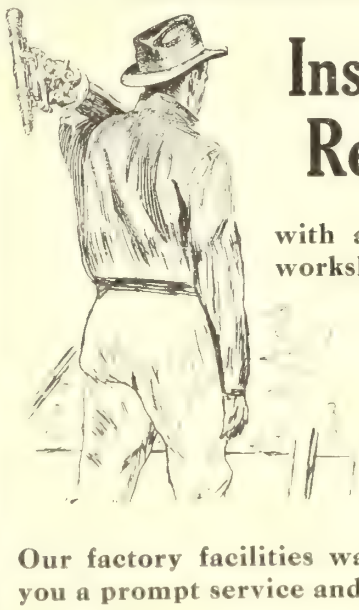

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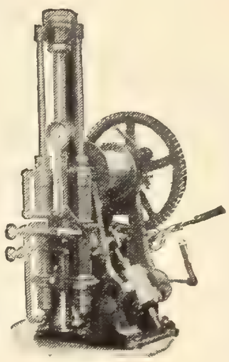

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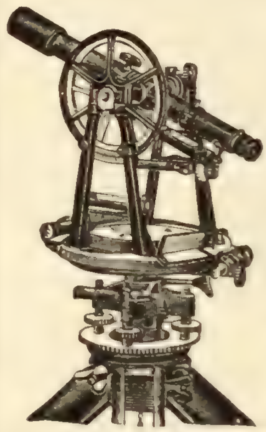

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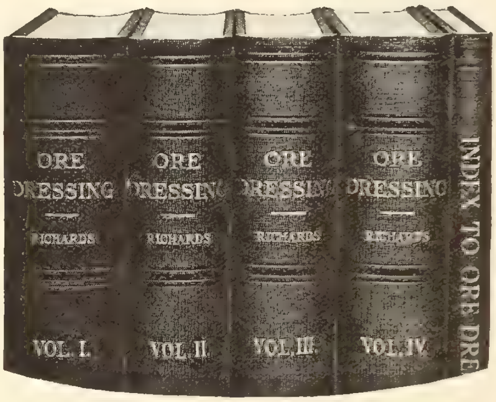

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CIRCULATION.

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CONTENTS.

THE EIGHT-HOUR DAY AGAIN.

In our last number appeared an editorial on this vexed question. Several correspondents, after reading that editorial, accused us of "trimming," and of sundry other heinous crimes. We wish, therefore, to present more fully our point of view.

Our editorial of October 1st was based upon the representations made by the mine managers of Cobalt to Commissioner Price. After commenting upon the arguments put forward by the operators, we made the following statements: "In principle the eight-hour day is sound. It has been applied successfully in several countries. It has also been applied unsuccessfully. Special conditions limit its applicability. If it is demonstrated that the special conditions outlined by the mine managers are sufficient cause for the retention of the longer day, the eight-hour day will be a mistake." To this opinion we still adhere.

At the outset, it must be clearly understood that, in the long run, the interests of owners and of employees are identical. Therefore, calm discussion, not violent controversy, is needed. The question then resolves itself into one of expediency. Is it, or is it not, expedient to introduce in any form the eight-hour day into the mines of Ontario? Our own opinion is that it is not expedient. And our reasons we shall give as plainly and as succinctly as lies in our power.

The mining industry of Ontario, although unquestionably in a prosperous condition, has not reached that stage of development where a change in working hours is either necessary or desirable. Prospects and small mines demand longer hours than do highly organized enterprises. The mere lack of working space and the duplication of effort make mining on a small scale expensive. This has been the case all over Ontario. It is particularly true of Cobalt.

Again, outside of Cobalt and Sudbury, how many mines have attained a dividend paying basis? One has little difficulty in counting them. But in a large number of localities there are prospects being opened and mines being worked that hold forth ample hope of profits. In almost every case the money available for this work is very limited in amount. Success largely depends upon speedy work. Any disturbing element now introduced would work havoc.

One fact that has generally been overlooked is that a considerable proportion of the miners do not want an eight-hour day. And this brings us to what seems to be the real gist of the matter.

As was pointed out in our former editorial, the miner is well paid, well fed, and well housed. His employment is less dangerous and brings higher remuner-

ation than that of almost any other similar class. In fact, the miner in Ontario has every reason, when he compares his lot with others, to be content. Why then this superfluous paternalism? Are there not a score of abuses to be remedied in our factories, on our farms, and in our shops and offices? When these shall have been studied and met it will be time enough to consider the much more fortunate miner. In a word, granting for argument's sake the need of an universal eight-hour day, the miner is much less in need of it than are thousands upon thousands of his fellow-citizens.

By way of contrast, it might be well to let the imagination dwell upon the present effect of an eight-hour day upon the farm. No doubt, when the electric appliances of the future do everything but sign the pay-roll, the farmer's help will work but one-third of the day. Now, however, the suggestion might not be heartily welcomed.

Is is to be remembered that the above is *The Canadian Mining Journal's* opinion as to the *expediency* of an eight-hour day in the mines of Ontario. Our former editorial dealt solely with the validity of the arguments adduced by the Cobalt operators.

We cannot close without correcting a sin of omission. In the category of those who sigh for remedial legislation we forgot to mention editors.

EASTERN ONTARIO GOLD MINING.

In this number of *The Canadian Mining Journal* we present an article on the Cordova gold mine, a mine that some years ago attracted much attention. Formerly known as the Belmont, it was operated by an English company for a few years. After lying idle for eight years, it has been re-opened by Mr. P. Kirkegaard.

The history of the mine under English control is of little interest beyond the fact that much territory and a fine water power were acquired, and complete overhead equipment installed. The power, which is generated three miles away at the foot of Deer Lake, is in itself a fine asset. At a very low cost, the equivalent of 750 h.p. as compressed air can be delivered to the mine. Provision is also made for 350 h.p. in electric energy.

The mine lies twelve miles north of the C. P. R. main line, the nearest station being Havelock, 100 miles east of Toronto. It is in the centre of a farming district, and within one quarter mile of a spur of the Central Ontario. The holdings embrace about 400 acres. A 30-stamp mill, fitted with cyanide plant, is as good as new. An adequate machine shop, shaft houses, and numerous dwellings, were built by the former owners. These are in good condition.

An extensive system of veins is known, and has been developed in part. The veins are fissure fillings in diorite. Along the fissures the diorite is replaced by chloritic schist, in which are intermingled quartz, calcite, and dolemite. In several places the veins outcrop as large domes of almost pure quartz. Impregnation by iron pyrites is frequent, and at these points the richest ore is found.

The fissure veins form a complicated network on a large scale. Only three veins have been worked to any considerable extent. From these workings gold to the amount of $300,000 was won in the early days.

The Cordova mine is now about to enter on a new phase of its existence. Mining will be conducted with the object of developing ore reserves equivalent to at least one year's supply. A close system of cost-keeping will enable the management to effect economies that were not enforced before. The ore will be handled in a cheaper and better manner, and much less "deads" will go through the mill.

As the ore is almost completely free-milling, and as the only sulphide present is iron pyrites (along with small amounts of pyrrhotite) it is believed that milling costs can be brought down to a low figure. The ultimate centralization of ore hoisting will lower underground costs. Hence, there is ground for the belief that Cordova has a profitable life before it.

Other mines are being opened in the same region. The Belmont iron mine is in the hands of the Buffalo Union Furnace Company. A stone quarry is being worked near Havelock. Altogether, the industry is brisker than it has ever been. And this means more for the surrounding country than a score of cheese factories. It brings a large increase of freight to the railways, gives steady employment to several hundred men, and adds directly to the wealth of the nation.

THE CONSOLIDATED REPORT.

The seventh annual report of the Consolidated Mining and Smelting Company of Canada has just reached us. The period covered is from June 30, 1911, to June 30, 1912.

The outstanding features reported are the increased net profit, which is $310,345.97; the acquisition of Le Roi mines; and the reduction of the company's obligation to the Bank of Montreal to $343,819.82.

The net amount expended in additions to plant and equipment was $105,017.19. The expenditure in the purchase and development of new properties amounted to $337,017.72. The gross value of metals produced at the smelter was $5,083,078, as compared with $4,437,901 for the previous fiscal year. Larger quantities of all the metals save copper were produced. The decrease in copper was due to the closing of the Snowshoe mine. Ore to the amount of 296,458 tons was smelted, from which were extracted 129,789 ounces of gold, 1,765,992 ounces of silver, 26,072,074 pounds of lead, and 2,914,181 pounds of copper. From the Centre Star group came 170,082 tons of ore; Le Roi being the next largest producer with 39,345 tons to its credit.

On the Centre Star group 29.55 miles of underground work was accomplished; 19.59 miles on the St. Eugene group, and 13.27 on Le Roi group. In addition to this diamond drilling to the extent of 20,282 feet was done.

the properties drilled being the Centre Star, Le Roi and Sullivan.

Deprived for six months of the regular coke supply from Crow's Nest Pass, the company was forced to pay a high price for Pennsylvania coke. This added an estimated amount of $120,000 to working costs. This and other unforeseen additions to expenditure were offset by the improvement in the ore shipped from Rossland, the latter ore coming largely from the lower levels of the War Eagle and the upper levels of Le Roi.

The tonnage of customs lead ore has increased markedly. The Kaslo and Slocan Railway, which serves the Slocan district, is being operated by the C. P. R. Shipments are now being regularly made. The report of the general manager of the Consolidated, Mr. R. H. Stewart, speaks most cheerfully of the present condition and the future prospects of silver-lead mining, but suggests strongly the desirability of more government assistance.

EDITORIAL NOTES.

The Granby during the week ending September 28, smashed all records by producing 30,363 tons of ore. This brings the total for the current year up to 936,145 tons.

The Dominion Steel Company's figures of production for September were high. The coke output, 44,540 tons, almost made a record. Pig iron production was 26,030 tons.

September was a particularly satisfactory month for the Nova Scotia Steel & Coal Company. The coal shipments aggregated 87,790 tons, and the iron ore mined, 57,913 tons. Production of pig iron and steel ingots was also large.

The last shipment of ore from the Miller Lake-O'Brien mine, Gowganda, contained about 100,000 ounces of silver. The shipment consisted of 22 tons of picked ore and concentrates.

Few articles have attracted more comment than that contributed to our Nova Scotia Special Issue by Mr. J. H. Plummer. It has been copied in many daily papers and editorially noticed on both sides of the Atlantic.

The annual meeting of Granby Consolidated was held on October 1st in New York. A gratifying surplus of $2,516,121 was announced. The statement was made that progress on the Hidden Creek property has been satisfactory, and that $200,000 has been expended there.

Our Porcupine correspondent predicts the likelihood of a one dollar dividend on Hollinger shares shortly after January 1st, 1913. If this be the case Hollinger will have the honour of declaring the first dividend earned in Porcupine, and will have helped in the most substantial way to make mining history.

The Northern Ontario Light and Power Co., Limited, has absorbed the British Canadian Power Company. The former company has declared net earnings during the first eight months of this year to the amount of $188,347. It owns and operates the hydro-electric plant at Hound Chute on the Montreal River, six miles from Cobalt.

In his speech of welcome to the members of the Canadian Mining Institute, at their recent semi-annual meeting in Victoria, B.C., Sir Richard McBride, premier and minister of mines for the Province, spoke in terms of warm commendation of the manner in which the western secretary, Mr. E. Jacobs, performed his duties. "It has always been a pleasure to me," said Sir Richard, "and to those associated with me in the Provincial Department of Mines, to work with Mr. Jacobs. We have invariably found him painstaking and anxious always to get at the truth of anything that has to do with mining in British Columbia, and ever ready to go to the utmost length.....to see that everything he publishes is positive fact." Sir Richard's encomium will be heartily endorsed by all those who have followed Mr. Jacobs' painstaking efforts to give our readers the truth and nothing but the truth.

CORRESPONDENCE

A MATTER OF HISTORY.

Editor Canadian Mining Journal:

Sir,—On returning from several months absence in Northern Ontario my attention has been called to an extraordinary statement in your special Quebec issue of July 1st. Under the heading "The Special Research Work of the Mining Department of McGill University" a writer, whose name is not given, asserts that "McGill was the first of the Canadian Universities to give instruction in mining and metallurgy as a regular course in 1871, and again the first to create and equip an independent department exclusively devoted to the subject in 1896." The facts are that up to 1893 no practical provision had been made anywhere in Canada for education in mining and metallurgy. In that year the School of Mining was opened in Kingston in connection with Queen's University, for the express purpose of filling this gap in education. Since that date there has always been a department here "exclusively devoted to the subject." Such well-known educational advances as the building of the first Canadian Mining Laboratory in 1894 and the organization in the same year of the first extension work in mining camps and the first courses for prospectors were made by the School of Mining and not by McGill. Comparisons are proverbially odious and I shall not follow up your correspondent's ingenious bit of advertising beginning "McGill still holds the premier place." We can all afford to be proud of McGill as a great Canadian University, but we must all regret that any misguided friend should put forward unfounded claims for her. McGill does not need such bolstering. I am

Yours sincerely,

W. L. GOODWIN.

Oct. 1, 1912, School of Mining, Kingston, Ont.

AN EASTERN ONTARIO GOLD MINE.

Written for The Canadian Mining Journal.

To that indefinite entity, "the average reader," it will be a matter of surprise to learn that for many years gold mining has been carried on in Eastern Ontario within a few hours' railway run of Toronto. If, for example, you leave by the morning C. P. R. express and get off your train at Havelock, you can be safely landed at one of the most interesting, and certainly one of the best equipped gold mines in Canada, in ample time to enjoy your mid-day meal. You merely drive twelve miles north from Havelock station and there you are.

Surface Outcrop

Concerning the beginnings of this mine, the Belmont (or Cordova), there is authentic record. Twenty-two years ago a farmer discovered visible gold in an outcrop on the wagon road. For a small sum the property was acquired a few years later by Mr. A. W. Carscallen, and in 1897 sold by him to the Cordova Exploration Company, of Newcastle-on-Tyne, England. From this time on, the history of the mine is a striking illustration of the vicissitudes that attend the search for gold.

The English company lost no time in getting to work. A 10-stamp mill was put in commission in December, 1907. Encouraging results were obtained from the first. In three years time the small stamp mill had crushed 15,267.5 tons of ore, which yielded 4,803 ounces of gold, of a gross value of $86,519. Thus the average value of the ore was $5.66 per ton, a good enough figure for a larger plant, but obviously yielding small annual profits from the small plant installed.

With this fact in view, and since the mine itself was in good shape with promise of enough ore to justify a considerable expenditure, it was decided to erect a larger mill, and to utilize a neighbouring water power to produce compressed air. These additions meant cheap and ample power, a larger mill capacity, lower costs, and naturally higher profits.

Up to this time about $75,000 had been expended in developing and equipping the mine. The additions to the plant entailed a heavy outlay, which outlay was apparently justified.

The new mill was completed in December, 1900. Strange to relate, while the estimated cost was $36,025, the actual cost exceeded this by only $2,400. The power plant, from which compressed air was conveyed in pipes three miles to the mill and mine, cost in all $85,000, as against an estimated cost of $60,000, not at all a bad showing in view of the engineering difficulties encountered.

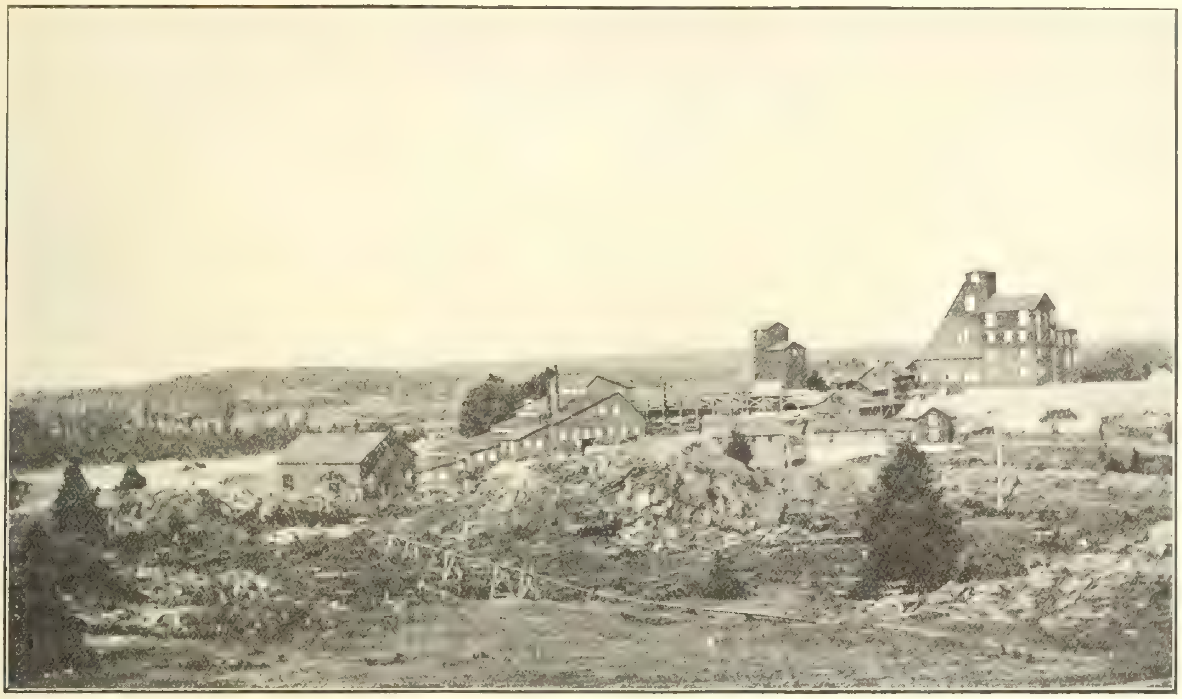
The whole plant was in excellent running order during the latter half of the year 1902. The mine had been developed to such an extent that more than 100,-000tons of ore was blocked out. These bodies were reported on by a distinguished English consulting engineer to contain $5.50 in gold per ton. Thus the ore proved to be ready to hand was worth in the gross at elast $550,000. Of course large unproved bodies of ore were also known to exist. But the 100,000 tons, with complete overhead equipment for mining and milling, constituted a sound commercial basis. The estimated cost per ton, including all charges of running, extraction, deveolpment (prospecting), administration, etc., was placed at $2.75. The mill was expected to handle at least 2,000 tons per month. Loss in tailings, at 50 cents per ton, would bring the total net returns from the ore to $2.25 per ton. The annual net profit, therefore, was calculated at $54,000. This was looked upon as a minimum, as it was known that the mine could supply larger quantities to the mill, and it was believed, for excellent reasons, that the mill's capacity could be readily brought up to 2,500 per month, or 30,000 per year, making the net annual profit about $70,000.

However, clouds larger than a man's hand appeared on the horizon. The enginee rin charge, and the consulting engineer could not see eye to eye. Operating costs far exceeded the estimates mentioned. Then one principal owner died, and then another. Everything appeared to conspire against the mine, until in 1903 it was closed. A mine and mill splendidly equipped, hundreds of acres of promising untouched mineral-bearing land; a developed water power; a freehold that cost $120,000; machinery, residences, and general improvements that implied an outlay of $500,000, were all abandoned before the only real asset, the mine, had been given a chance to yield returns. Only $300,000

Below Deer Lake Dam

in gold had been taken out of the mine, and much more was actually available.

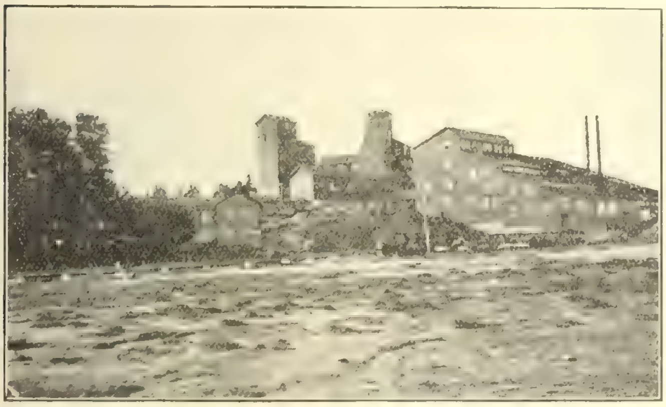
Naturally, in the succeeding years the Belmont became the subject of many negotiations. Several Canadian mining investors, among them one whom the high gods smiled upon superfluously in Cobalt, made offers for the property. Offers also came from the United States. But it was not in accordance with hu-



General View of Cordova Plant

man nature for the English unfortunates to part easily with their costly possession. It remained, however, for a Canadian mining engineer to bring matters to a successful head.

Mr. P. J. Kirkegaard, who had been for many years identified with mining in Eastern Ontario, and who has had wide and varied experience in other parts of the world, succeeded in negotiating satisfactorily with the former owners. He is now in possession, and in a few weeks the thirty stamps will be dropping. Meanwhile, the mine has been put into good condition, the large



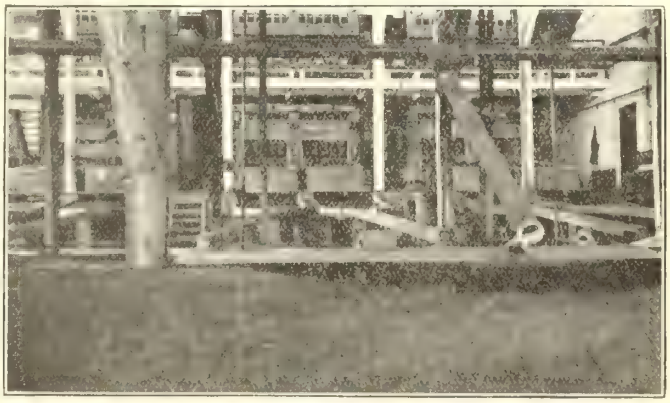
30 Stamp Mill. No. 1 Shaft House and Tank House

compressor, capable of developing 750 h.p., has been thoroughly overhauled, and the installation of electric equipment—equipment already on the ground—will soon be completed. Thereby 350 h.p. will be devolped at the dam and transmitted to the mine. This gives a total of 1,100 h.p. at the cheapest rate in Ontario.

Early in November, therefore, the mill will be treating from 90 to 100 tons of ore per day.

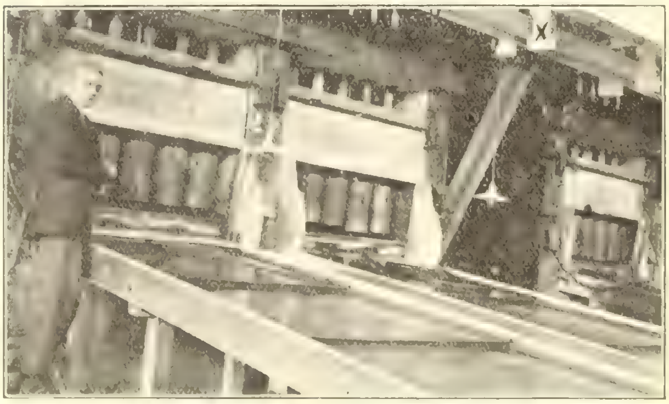
Equipment.

Power Plant.—Two concrete dams at the foot of Deer Lake are the source of power. From the dam a 6-foot wooden barrel flume conveys the water 1,550 feet to the power house, which is a substantial two-storey bulding. Here are installed a pair of 50-inch bronze Leffel turbines which are capable of developing 800 h.p. A pair of 30 in. and 40 in. by 4 ft. Walker



Interior of 30 Stamp Mill.

Bros. compound compressors, fitted with inter and after coolers are driven by means of a 30-rope drive.



Interior of part of 30 Stamp Mill

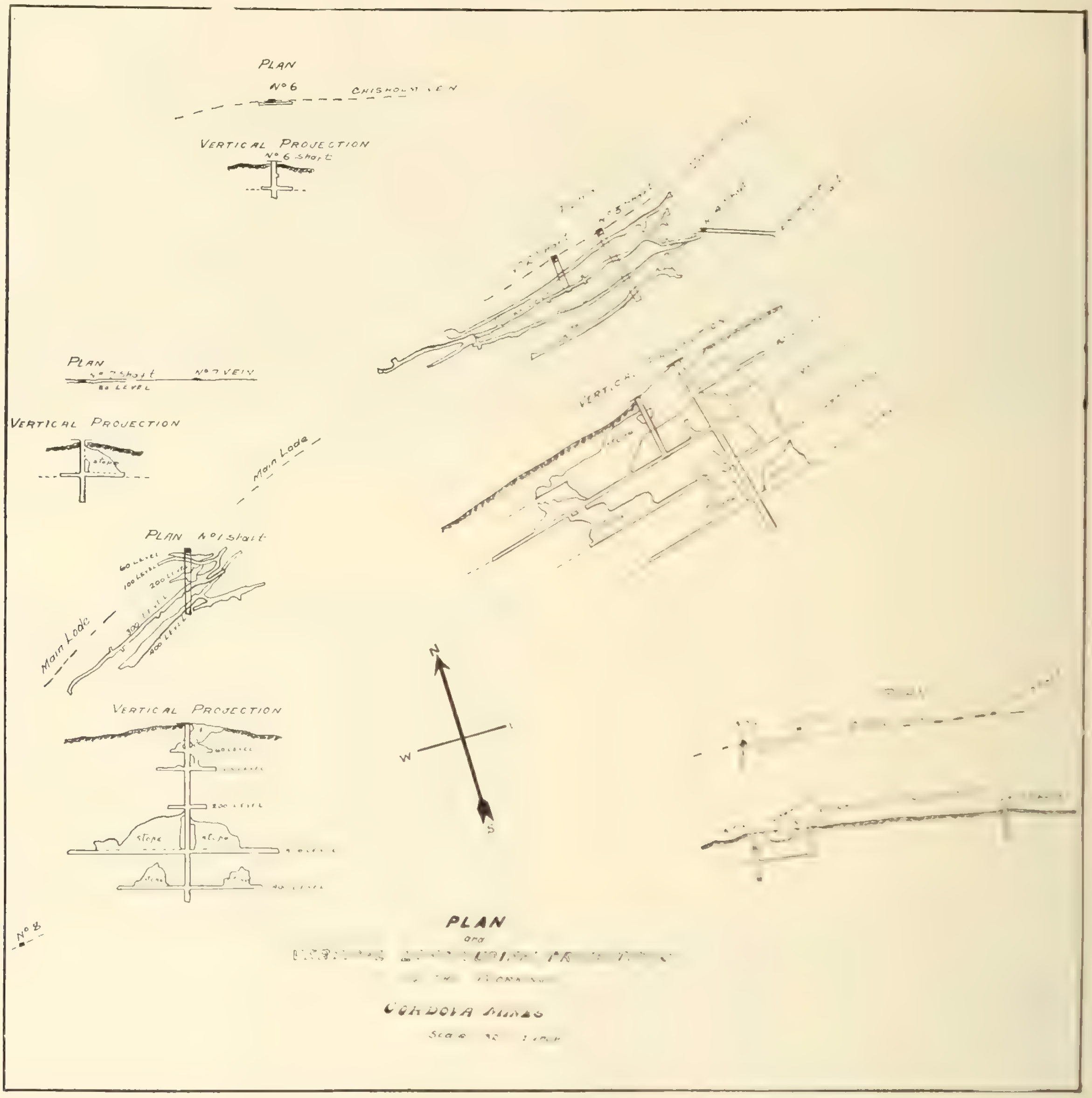
The electrical equipment, now almost completely installed, includes a pair of 23-inch turbines, with

Woodward governor, driving a 250 k.w. three-phase Bullock generator, one 125-volt exciter, and much other machinery.

Compressed air is delivered through three miles of 12-inch steel pipe fitted with two air receivers and all necessary expansion joints and valves.

The Mine.—At the several shafts are five single-drum and two double-drum hoists. At No. 1 shaft the large crusher are placed behind the bins. The storage capacity is about 500 tons, and the ore is conveyed to the mil lby tram direct from No. 1 shaft.

Six Wilfley tables follow the plates. The cyanide outfit consists of eleven circular steel tanks—three 30-ton tanks for leaching, two 10-ton solution tanks, two 2-ton gold tanks, and two 8-ton sump tanks. In addition there are one wooden acid tank, one wooden settling tank,



building contains one large gyratory crusher of a capacity of 40 tons per hour, and other necessary con veying and handling equipment.

The underground machinery includes one 14x7x12 Knowles duplex station pump, eight other duplex pumps of various sizes, three single pumps, five sinking pumps, 15 Mac drills, two baby drills, and an adequate number of skips, cars, and buckets.

Six hundred feet of trestle, on which 8,000 feet of rails is laid, has been erected for ore handling between mill by tram direct from No. 1 shaft.

The Mill.—The mill equipment embraces thirty 850-pound stamps in three sets of ten each. Challenge feeders are fitted to the batteries. The amalgamating plates are 32 feet in length. One 20x10 Blake jaw crusher, one gyratory crusher, and one 7x10 Blake jaw three eight-compartment wooden zinc boxes, two brick smelting furnaces, and one calcining furnace. The furnaces are lodged in a solid brick annex.

The mill has an independent power house, and an electric light plant.

Other Buildings.—In a two-storey frame building are the machine shop and the blacksmith's shop. Here are one large and one small lathe; one 6-foot planer; and other cutting and threading machines. The warehouse is a two-storey solid brick building. The assay office is a solid brick, five room building containing full equipment. The general office is a frame building attached to the warehouse. In addition to the manager's residence, and a large building for the accommodation of the staff, there are ten dwelling houses and one large general store building, all of which belong to

the company. There are, of course, other buildings such as magazines, sampling house, barns, etc.

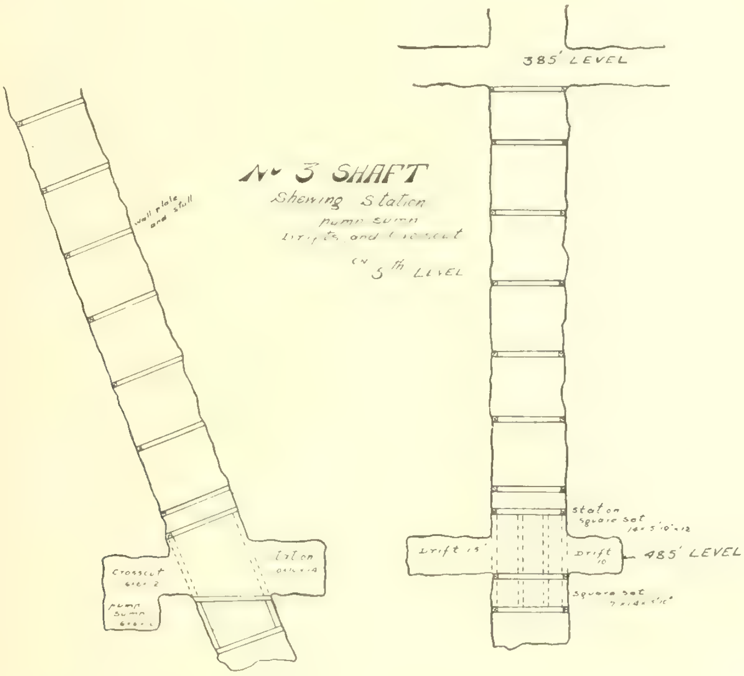
. . . .

The ore mined at Cordova is essentially free milling. From two to five per cent. in weight of gold-bearing iron pyrites occurs with the ore. Small quantities of pyrrhotite are also found. The ore itself consists predominatingly of quartz with which schist is admixed in varying proportions. The veins are irregular fissures in diorite. The workable widths range from six to twenty feet. Huge bosses or domes of quartz outcrop within a few hundred yards of the mill. So far as underground work has been carried, the pay shoots are persistent. While no really spectacular ore is encountered, the range of assay results is wide—all the way from \$2 and \$3.50 to \$18 and \$20. For the future supply of the present mill, however, it is believed that substantial bodies of ore carrying from \$4 to \$6 per ton are available. Later on, if the mill is enlarged, lower grade ore will become payable.

The stamps are light, weighing only 850 pounds. It is the intention to weight them up to 1,000 pounds. The stamps will drop 102 to the minute, the height of drop will be eight inches, and the screen used will correspond to 40-mesh. The extraction by amalgamation will be about 75 per cent., and cyanidation will bring this up to 90 per cent.

It is proposed later on to add a tube mill to the plant, and to add, also, heavier batteries. This, however, is for the future. The mill can take care of the mine's output for some months to come.

The absence of a high share capitalization, the cheap power, the large size of the ore bodies, and the fact that only very little money has been needed to put the plant in working order, all are favourable factors.



A recent writer describes the operation of the Erie mine in California. Here the mining and milling costs have been reduced to the surprising figure of \$1.71 per ton of ore. This includes sinking fund and amortization. The mine is a small one employing only 27 men, and the mill has but 20 stamps. While it is most dangerous to institute comparisons, yet it is reasonable to believe that costs can readily be gradually reduced at Cordova.

COMBINATION OF THE CONTACT PROCESS WITH THE ORDINARY LEAD CHAMBERS*

BY WILLIAM WILKIE, Buffalo, N. Y., U.S.A.

Since the introduction of the contact system as a practical method for making sulphuric acid, it has been usually regarded as simply a competitor of the older chamber or tower systems. It may be of interest to bring before you a system in which the contact function is combined with the chamber system, giving a successful working method that shows economies and advantages not generally appreciated, but very worthy of attention.

Some time ago I was called upon to construct a chemical works, which should be thoroughly equipped for the manufacture of mineral acids, the main problem involved beingthe construction of a plant wherein sulphuric acid of the various commercial grades and concentrations could be manufactured in the most economical way. My clients had already an installation of the contact process licensed under U. S. Patents of the Verein Chemischer Fabriken in Mannheim, for the production of strong acid, and the question arose whether we could economically and profitably reduce this highly concentrated acid to lower strengths.

*Paper presented at the Eighth International Congress of Applied Chemistry, New York, September, 1912.

In calculating the cost we have to take into consideration the license fee and other fixed charges, and it was found in the end that it was impossible to do this. There was, however, a market for chamber acid; consequently it was thought possible to combine the contact process with the chamber process and attain the end in view.

As a result of the study of conditions, a plant was designed as shown in the illustration. In order to be independent of the constant variations in the pyrites market and the possible scarcity of pyrite fines, the plant was so designed that lump ore as well as fines could be roasted, the burning capacity finally adopted being 24,000 pounds fines, and 36,000 lump ore. Thirty-six lump burners were installed, each able to handle from 900 to 1,200 pounds ore daily, and four standard Herreshoff fines burners.

The gases from the fines burners were conducted into a flue situated above the flue of the lump burners and provided with a number of baffie walls to catch some of the dust. The gases of the lump burners and fines burners were united and conducted into the patented iron-oxide-contact-shaft, similar to the contact process chamber of the Verein Chemischer Fabriken. In order to regulate the draft of the fines burners, a separate exhaust fan was installed to draw the gases from the fines burners and deliver them into the flue over the lump burners. A second exhaust fan was installed between the iron-oxide-contact-shaft and the Glover tower, which took the sulphurous gases after they had undergone conversion, to the extent of 30 per cent., into SO_3 by the iron-oxide-contact-shaft and forced them through the Glover tower into the chamber system.

The combination of the two very distinct processes into one system gave most excellent results. It was found that:

1. The capacity of the chamber plant was increased at least 30 per cent.

2. The conversion of SO_2 to SO_3 in the iron-oxide-contact-shaft averaged about 30 per cent.

3. At the same time the acid produced in the Glover tower was water-white.

4. The iron oxide eliminated 95 per cent. of the arsenic carried by the gases leaving the roasters and flues.

Finally it was proved that the total production of the chamber system could easily be concentrated to 60° Baume or higher in the Glover tower.

Such satisfactory results are all attributable to the introduction of the iron-oxide-contact-shaft between the burners and the Glover tower; in other words, to the suitable combination of the contact and the lead chamber processes.

The iron-oxide-contact-shaft retards the dust and is the best known means of keeping dust from getting into the chamber system; it is an accumulator of heat and acts as an equalizer on any system, such as that described, enabling the operator of the plant to carry out the process more uniformly; it saves 30 per cent. of the nitre consumed in the ordinary plant, on account of the conversion of the catalytic action.

Since constructing the above described plant, the iron-oxide-contact-shaft has been introduced in other existing chamber plants with equally good results.

The combination of the contact and chamber processes for the manufacture of sulphuric acid has been carried out by forcing the gases from lump and Herreshoff fines burners first through an iron-oxide-contact-shaft similar to those of the Verein Chemischer Fabriken, where some 30 per cent. conversion of the SO_2 to SO_3 takes place, and thence through a Glover tower into a set of lead chambers. An increased production of about 30 per cent., with low nitre consumption and clear water-white acid of 60° Be practically free from arsenic is obtained.

Any style of chamber plant can be equipped with such an iron-oxide-contactshaft and its capacity increased considerably without changing any part of the chamber end of the plant. All that is necessary is to insert this apparatus between the burners and the Glover tower.

THE WESTERN MEETINGS OF THE CANADIAN MINING INSTITUTE.

The semi-annual meeting of the Canadian Mining Institute was held in Victoria, B.C., on Wednesday and Thursday, September 18th and 19th, adjourning to Frank, Alberta, on Monday, September 30th. A full report of this meeting will be published in our next issue. It may be stated, meanwhile, that the meeting, both in British Columbia and Alberta, was successful. In Victoria, the Institute was welcomed by the Premier and Minister of Mines, Sir Richard McBride, who delivered an interesting and instructive address on the recent developments of the mining industry of the province and also referred appreciatively to the work of the Institute. The mayor of Victoria and the president of the Victoria Board of Trade also addressed the members. During the morning session of the first day, the proposed amendments to the by-laws were discussed, and a resolution was adopted urging the appointment of a Minister of Mines for the Dominion. At the adjourned meeting at Frank, this resolution was endorsed. Among the papers read and discussed were, at Victoria: The Relation of Earthquakes to Colliery Explosions, by Frank Napier Denison; Fuel Problems of the Pacific, by H. Foster Bain (read by Mr. D. B. Dowling); The Geology and Mineral Resources of Northern Quebec and Ontario, by Dr. A. E. Barlow; and Notes on Copper Mining in British Columbia, by E. Jacobs; and at Frank: Engineers' Reports on Property, by W. D. L. Hardie; Provincial Mining Legislation, by W. F. McNeill; Jasper Park Collieries, by R. H. Morris; and Notes on the Work and Scope of the Canadian Mining Institute, by H. Mortimer-Lamb.

Before the close of the meeting at Frank, the members present decided to organize what will be known as the Rocky Mountain Branch of the Institute, to which will be attached all members resident between Fernie and Medicine Hat. The following gentlemen were elected to serve as an executive committee of the newly created Branch: Mr. W. R. Wilson, general manager of the Crow's Nest Pass Coal Company, Fernie, B.C. (chairman); Mr. J. T. Stirling, Provincial Inspector of Mines, Edmonton (secretary), and Messrs. W. F. McNeil, Lewis Stockett and O. E. S. Whiteside

As indicative of the interest and enthusiastic spirit that prevailed it is worthy of remark that at a subsequent meeting of the Branch executive, the chairman, Mr. Wilson, offered to donate three prizes, aggregating the sum of one hundred and fifty dollars, for papers on specified subjects contributed by any member of the Branch to the Institute's Transactions.

NEW DOMINION COPPER COMPANY.

The report of the New Dominion Copper Company, which has mines in Boundary district, B.C., for the fiscal year ended March 31st, last, shows total shipments of ore during the year amounting to 179,605

ons. Four series of shipments were made to the British Columbia Copper Company's smeltery at Greenwood, B.C., under various rates for smelting. The existing rate of April 1st, 1911, was upon the basis of the Dominion Company paying the actual smelting cost of the British Columbia Copper Company, plus 50 cents a ton.

Owing to the strike of the coal miners in the Crow's Nest Pass coal district and the importation of Connellsville, Pennsylvania, coke by the British Columbia Copper Company, the smelting costs of that company were increased and a new arrangement for the smelting of the New Dominion Copper Company's ore was accordingly made. This arrangement was put into effect on June 1st, 1911, and was in substance a minimum royalty of 20 cents a ton to be paid to the New Dominion Copper Company by the British Columbia Copper Company after calculating ore returns on the basis of the previous arrangement.

The grade of ore, combined with the increase in smelting costs, due to use of Pennsylvania coke, and the decreasing price of copper, did not allow of any royalty being paid beyond this. Subsequent to July 1st the ore has been smelted on a new basis arrived at by a committee of impartial engineers representing the respective interests concernd, these nginers having fixed a definite smelting rate and slag deductions. Apart from this the British Columbia Copper Company guarantees to the New Dominion Copper Company a fixed profit of 15 cents a ton, regardless of whether or not such amount is realized from the ores.

The balance sheet as of March 31st, last, follows:

Assets.

Mines, smeltery and other properties	$1,311,892
Inventories and ore in transit	26,059
Unexpired insurance	701
Accounts receivable	91,125
Cash in banks	114,578
Profit and loss acount	149,102
Total	$1,693,457

Liabilities.

Capital stock	$1,178.320
Income bonds	491.725
Accounts payable	15,778
Reserve	7,634
Total	$1,693,457

(Note.—The foregoing information should have appeared earlier, but after preparing it, our correspondent inadvertently mislaid it.—Ed.)

THE RESCUE STATIONS OF THE ALBERTA GOVERNMENT.

By H. Mortimer-Lamb.

One effect of the last disastrous explosion at the Bellevue mine, which resulted in the loss of thirty-one lives, was to bring forcibly home to the provincial authorities the need of providing means for effective rescue work in the case of future colliery accidents in Alberta. To Mr. John T. Stirling, Provincial Inspector of Mines, is due the credit for initiating the plans that were finally adopted towards accomplishing this end. In March of this year, the first Government rescue station was established at Balirmore; another is now being established at Lethbridge; a third will be established at Kipp before the close of the year; while next year there will be stations at Canmore and Bankhead, and in due course every coal district of the province will be so provided. For the maintenance of these stations an annual levy is made on the coal companies, but the administration, operation and control of the stations remains entirely in the hands of the Government, as represented by Mr. Stirling. Each station is in charge of an official, who must hold a mine manager's certificate, and be otherwise specially qualified for the position. The time of this officer is mainly occupied in training men for rescue duty, while should a disaster occur he would be called on to superintend the work of rescue, or of fire-fighting, as the case might be. The men are trained one at a time, the preliminary course occupying a period of six days. Six months later the candidate returns for another day's training, and after a further interval of three months, is subjected to a test for efficiency. If he passes this successfully he is granted a certificate and a distinguishing button. When five men from any one colliery have thus been trained they are constituted a team and are given a special course in team drill. Eventually team competitions will be held. Before a man is allowed to commence a course of training, he must submit to a very severe physical examination. The requirements in this respect are illustrated in the following form:

Form I.

CROW'S NEST PASS MINE RESCUE STATION

PROVINCE OF ALBERTA

Qualifications of Rescue Men.

Mining men 22 to 45 years old, in good physical condition, who are temperate in their habits and naturally calm and deliberate, are best suited for mine rescue work.

Before a man undergoes training in the use of breathing apparatus, he must be examined by a physician to ascertain his physical condition, especially the action of his heart and lungs and any defects of the nose or throat. Unless a man has a physician's certificate stating that his physical condition is good, he must not be permitted to take rescue training nor to attempt rescue work in a mine.

Physician's Examination.

Date..........Hour..........

Name.............Age........Residence..........

Occupation..........How long so employed.........

Time of last meal..........Previous illness of recent date, having regard to rheumatism, fits, spitting of

blood, asthma, bronchitis, giddiness, vertigo, or any unsteadiness of gait..............................

Habits as regards smoking and drinking............

....

General appearance, paying special attention to the breathing passages, tonsils and nostrils, also ocular conjunctiva, and any infectious condition...........

....

Urine.........General shape and expansion of chest.. ....(See that clothing is loose)

Frequency of breathing..........................

Pulse: frequency...........and character...........

....

Condition of lungs..............................

Condition of arteries and veins.................... ....Heart action...................

....

Nervous or composed temperament?...............

The candidate is.........................condition to undergo mine-rescue training.

(Signed)...........................

Physician.

Condition After Trial.

After having executed the first one-hour training in unbreathable air:

General appearance..............................

Color...

Headache, Giddiness, Vertigo and Unsteadiness of Gait...

Frequency of breathing............Time required to become normal..................................

Pulse frequency.................Character and time required to become normal.......................

(Signed)...........................

Superintendent.

Rescue training should not be undertaken just after eating, nor less than two hours since the last meal. After having used the apparatus continuously for two hours, a man should rest for six or eight hours before wearing it again. During work or travel in a mine the wearer should frequently rest by sitting.

After the six days' training has been completed, the superintendent of the station fills out a form on which certain information is recorded in respect of each candidate for a certificate. The following is a typical record of the kind:

Form II.

CROW'S NEST PASS MINE RESCUE STATION

PROVINCE OF ALBERTA

Mine Rescue Training Record.

1 Car No...........
Station No.......at.....Wearer's name....No ..
2 Address...............Occupation.............
3 Employer.......................................
4 Chest: Normal.... Contracted.... Expanded....
Expansion......................................
5 Age...Weight...Height...Where Born.........
6 How long in Alberta......................Can he read and speak English...........Married......
7 How long has he been engaged in mining........
Coal or metal mines..........................
8 Pulse and respiration; while standing P....R....; after hopping 20 ft. P........R...............
9 Date on which apparatus was explained..........
Time occupied...................................
10 Date on which miner charged and set up apparatus....................Time occupied.......
11 Type of apparatus used in training.............
Number...
12 Does he hold a First Aid Certificate........Where obtained.......When obtained......Associ......
13 Month in which training was given.............
14 Dates on which training was given...............
15 Reading of W. G. before commencement.........
16 Schedule of training used.......................
17 Time occupied, wearing apparatus..............
18 Trained in SO_2, smoke or fresh air...............
19 Trained in car, smoke room, or elsewhere.........
20 Temperature of air...........................
21 Distance walked (miles or fractions)...........
22 Distance crawled (feet) ....
23 Number of trips over overcast..................
24 Height ascended (feet).........................
25 ....pounds of........carried (feet)............
26 ....pounds Sand bag lifted......ft. times.....
Work machine operated
27 Size of prop used.............................
28 Sawed end off how many props.................
29 Number of timbers set up.....................
30 Pulse just before taking off apparatus..........
31 Oxygen remaining when taken off.............
32 Dizzy (1); Tired (2); Exhausted (3); Headache (4).......................................
33 Percentage.....................................
34 Total time wearing the apparatus....Hrs.....Mts.
35 Has the wearer full confidence in the apparatus...
36 Would he make a good mine rescue man.........
37 Is he entitled to a certificate...................
38 Efficiency percentage...........................

Date........19... ....

Superintendent.

Remarks:

....
....
....
....

The equipment at the Blairmore Station includes 11 "Fleuss" Proto Breathing Apparatuses, 6 Salvators, 2 compressing pumps, 30 storage cylinders of 100 cubic feet capacity, containing oxygen at a pressure of 1,700 lbs. to the square inch; a Draeger Pulmotor; leather helmets for fire fighting; electric mine lamps fitted with wooden bases (these bases serve a purpose in facilitating crawling); and a stock of other necessary supplies Canaries are also kept for use in testing for gas.

The station at Lethbridge, which is of a more pretensious character than that at Blairmore, is provided with a washing room, shower bath, reading room, office, store room and smoke chamber. This latter is an air tight room in which much of the actual training is conducted, the men wearing the apparatus while the atmosphere is charged with fumes from burning sulphur. They thus acquire confidence.

At both Blairmore and Lethbridge plans of all the mines of the province are filed and every mine is in telephonic communication with the stations. Thus, in case of need, aid may be rendered with the least possible delay and to the best advantage. Although, of course, the stations are maintained for the protection of the coal miners of Alberta, Mr Stirling assured me that in the event of aid being required, either in British Columbia or in the States to the south, it would be willingly rendered.

The department, through Mr. Stirling, is meanwhile negotiating with the Canadian Pacific Railway for the use of a car, which it is designed to equip with rescue apparatus and ambulance requirements, and employ both for educational and for actual rescue purposes. It is hoped that the company will place such a car at the disposal of the authorities.

It is interesting to note that in the selection of equipment for the Alberta stations, the Fleuss apparatus has been preferred to other types now in use. The choice in this respect was largely determined by a recent report of a Committee of the South Midland Coal Owners of Great Britain, from which the following extract may be quoted:

"The Fleuss apparatus is undoubtedly the most comfortable one to wear so far as the distribution of the weight is concerned. In mechanical construction it is superior to any we have examined, and the mouthpiece attachment and its connections are excellent. In design the apparatus is simple, and unlikely to get out of order, although under the more severe test conditions several serious defects have been noted. The circulation of the oxygen through the absorbent is carried on by means of the energy of the respiratory muscles, and, comparing the efficiency of absorption with other apparatuses, the results obtained during active and severe exertion are not so good as those obtained with the Draeger and Meco under similar conditions. On the other hand, in no instance under normal conditions has the CO_2 percentage ever reached a figure sufficiently high to produce dyspnoea in any of the tests. A serious defect in this apparatus is the excessive temperature which the inspiratory air attains after the apparatus has been worn for an hour or so with moderately hard exertion. . . . For work under normal conditions and as the apparatuses now stand, we are of the opinion that the Fleuss is superior to any of the others we have examined; the order of preference for such work being: (1) Fleuss, (2) Draeger, (3) Meco."

Since this report was written, however, the major defect of Fleuss apparatus, as indicated by the committee, has been remedied by the provision of an efficient cooler and saliva trap, so that the main drawback to the apparatus has now been removed. The advantages of the Fleuss, moreover, are very considerable. In the first place, the total weight of the apparatus is but 32 pounds, or five pounds lighter than the Draeger, while this weight is much more evenly adjusted than in apparatus of other makes. Again, all valves are placed at the side and so are readily under control, and at need the oxygen may be supplemented by the use of an emergency or by-pass valve. It may here be noted that all valves are very carefully tested each week by the superintendent of each station, and the results tabulated for record. The forms on which the superintendent makes his weekly returns to the department are here appended:

One point more in favour of the Fleuss: It employs caustic soda instead of potash as an absorbent. Not only is caustic soda obtainable anywhere, but it possesses the advantage of remaining practically hard, dissolving away from the surface only, whereas potash when exposed to moisture becomes a pasty clay-like mass which greatly reduces the area of its absorptive surface. The makers recommend the use of soda in the form of sticks, but Mr. Stirling has proved conclusively that the lump soda, which is a great deal cheaper, gives in every respect, equally satisfactory results.

ABSTRACT OF MINUTES OF MEETING OF NATIONAL MINE RESCUE AND FIRST AID CONFERENCE.

Committee on Rescue Apparatus and Rescue Training.

Resolution No. 1.—The Committee recommends that such breathing apparatus as may be used for mine rescue and mine recovery work shall be of those types that have passed the tests of the Bureau of Mines.

Resolution No. 2.—The Committee indorses the course in rescue training as outlined by the Bureau of Mines' schedule for educational purposes and for familiarizing miners in the use of the breathing apparatus, and further indorses the recommendations of the bureau to the extent that for actual mine rescue work supplemental and practical training of two hours each should be taken at intervals of not more than three months.

Resolution No. 3.—The Committee recommends that all mine rescue stations should be equipped with at least five breathing apparatus and the necessary accessories for the continuous operation of the apparatus for 24 hours, and at remote stations, 48 hours. Such equipment should be so located as to admit of its assembly in one hour at a central point for emergency.

Resolution No. 4.—The Committee recommends the keeping of birds and mice at rescue stations for the purpose of detecting carbon monoxide.

Resolution No. 5.—The Committee recommends that all persons, before being admitted for rescue training, present a medical certificate qualifying them for rescue work and free from contagious diseases.

Resolution No. 6.—The Committee recommends to the Bureau of Mines that it prepare lists of stations, together with the names and addresses of the persons who have completed training with mine rescue apparatus, and that the names be listed on a mine rescue roll of honor and submitted to the local press for publication in the various mining localities. Volunteers to be compensated for services and considered when promotions are being made.

Resolution No. 7.—The Committee recommends that the smoke room is best adapted for the first course of training. In addition to the above training, as prescribed by the Bureau of Mines outline, supplementary practice to be taken underground is desirable.

Committee on Rescue Operations.

The following resolutions covering Item No. 1, "Use of Untrained Men in Rescue Work," was adopted in meeting of the entire committee:

Resolved.—That in rescue work untrained men should not be permitted to use breathing apparatus except when it is the only chance to save life, and in selecting untrained men it should be remembered that discipline is of equal importance to training.

The following outline of procedure before and after entering a mine following explosions or mine fires, was reported by a sub-committee:

Outside Organization.

1. All openings to be carefully guarded.

2. There should be a man in charge of outside arrangements to see that ventilating appliances are put in condition for operation, so as to be ready to operate when conditions require it.

3. See that good, competent men are placed at all openings to the mine and that they obey the orders given.

4. A competent person to be placed near the entrance to the mine to examine all safety lamps before they are allowed to be taken into the mine.

5. Some specified person to be placed at the entrance to check off all persons and make a record of same when they go into and come out of the mine.

6. Proper provisions to be made in the way of food and shelter to take care of parties engaged in rescue work.

7. A physician to be on hand while rescue parties are in the mine.

8. Safety lines to be established around all openings inside of which lines no open lights should be allowed.

9. A man in charge of the rescue squads to organize and have them ready to enter the mine when called upon.

Inside Organization.

1. A man to have full charge of the inside operations on each shift.

2. An advance squad under a competent leader to explore the workings in advance of the other squads who are advancing the ventilation, making repairs, and the stretcher squads.

The squads are to advance in the following order:

(a) Breathing apparatus or advance squad.
(b) Stretcher squads.
(c) Temporary ventilation squad.
(d) Material squad.
(e) More permanent ventilation squad.

3. A station to be established, which point would form a base of operations from which to work, and with a competent person in charge who would re-examine all lights before they pass beyond him to the interior of the mine.

4. A telephone should be establihsed at this station to communicate with the surface, and to be carried into the workings as fast as possible.

5. No person to go in advance of the ventilating current except the advance squad, which shall make an examination of the atmosphere for gas, and examine the return air current frequently for indications of fire; also for any other dangers which are likely to exist.

6. A doctor should be stationed at this inside station with necessary supplies for his use.

7. While advancing into the mine all unexplored openings to be dangered off.

8. Strict discipline to be maintained at all times.

A second sub-committee to consider questions Nos. 3 and 4 was appointed, which reported to the committee as follows:

Question No. 3.—The maximum distance rescue crews should proceed beyond fresh air. We recommend that, owing to the different conditions in different mines and the hazardous work undertaken, this question should be left to the decision of the official in immediate charge, in conjunction with the mine officials, and the probability of being able to save human life, using the time limit on all explorations.

Question No. 4.—Necessary rest for rescue men and limit of hours of work. That the shift should not exceed two hours, except when absolutely necessary. This should be followed by not less than six hours' rest.

Both of the sub-committee reports were accepted as read.

As to Sections Nos. 5 and 6, a resolution was introduced and passed as follows:

Article No. 5, "Cumulative Effect of Imbibing Poisonous Gases," and Article No. 6. "Use of Stimulants." be referred in General Conference to the Doctors' Committee.

Committee on Safety Lamps and Electric Lamps.

Recommendation No. 1.—No open light should be used.

Recommendation No. 2.—In coal mines only such types of safety lamps and electric lamps as have passed the tests of the United States Bureau of Mines to be used.

Recommendation No. 3.—Electric lamps unaccompanied by safety lamps should not be used unless the party is equipped with breathing apparatus.

Recommendation No. 4.—It is recommended that both safety lamps and electric lamps always be used to the point where breathing apparatus is put on and that beyond such point no safety lamps be used except one carried by the leader of the party, if explosive gas is not present in dangerous quantities.

Committee on First-Aid Methods.

Recommendation No. 1.—Be it herewith resolved that it is the sense of this committee that the Sylvester method of artificial respiration be the one adopted, providing no injury prohibits the use of this method.

Recommendation No. 2.—Be it further resolved that it is the concensus of opinion of this committee that in the dislocation of a hip or a shoulder, the dislocation should not be reduced, but that the limb should be fixed in the line of deformity.

Recommendation No. 3.—Be it further resolved that it is the consensus of opinion of this committee that a man injured with a broken back should be handled with as little movement as possible. If found in any other than a recumbent position, he should be kept in that position; if found in a recumbent position, apply posterior splints extending from head to feet, or lay upon rolled blankets.

Recommendation No. 4.—Be it further resolved that it is the consensus of opinion of this committee that in the treatment of all fractures of all long bones it is necessary to apply splints long enough to fix the joint above and below the fracture; for example: if there is a fracture of the leg, you have to apply the splints so that they extend below the ankle and above the knee. Be it further resolved that this committee endorses the forearm and arm splints as designated in Dr. Shields' text book on first-aid.

Recommendation No. 5.—Be it further resolved that it is the consensus of opinion of this committee that it should not be the duty of a first aid man to reduce a dislocation, except in the case of the lower jaw or the fingers.

Recommendation No. 6.—Be it further resolved that it is the opinion of this committee that the triangular bandage should be used in preference to the roller bandage.

Recommendation No. 7.—Be it further resolved that t is the opinion of this committee that a first-aid man hould not be allowed to wash a wound. Be it further esolved that it is the opinion of this committee that n application of any foreign substance to a wound, ther than a sterile substance, should be condemned.

Recommendation No. 8.—Be it further resolved that t is the opinion of this committee that in the absence f sterile or antiseptic dressing in case of a severe hemrrhage, the same being controlled by a tourniquet, hat no dressing be applied to the wound.

Recommendation No. 9.—Be it further resolved that t is the opinion of this committee that an injured peron should be carried on a stretcher feet first unless here be some contrary indication.

Recommendation No. 10.—Be it further resolved that n the case of an electric shock the current be either ut off or short-circuited first if possible; if this is not ossible, then insulate yourself, and remove the patient rom the body which carries the current, or remove the ody which carries the current from the patient. Be t further resolved that this committee recommends hat the article in Miner's Circular No. 5, issued by the Bureau of Mines, in regard to the treatment of electric hock be adopted.

Recommendation No. 11.—Be it further resolved that t is the opinion of this committee that in moving an njured man he should be handled by the first-aid corps n the same side as his injury; in other words, the inured side should be next to the men lifting the injured atient. Be it further resolved that it is the opinion of his committee that an injured man should have the ight-of-way from the place where he received the inury to the surface in all cases.

Recommendation No. 12.—Be it further resolved that his committee would recommend, if this organization s perfected, that a committee of seven persons consisting of two first-aid men, two operators, two physicians and one representative of the Bureau of Mines be appointed to act as an advisory board or as an executive board. This committee will have the power to accept or reject any new dressings that may be offered in any ield contest.

Committee on First-Aid Training.

On motion of Dr. Shields, seconded by Dr. Rountree, Dr. Knoefel was elected chairman of the meeting.

Dr. Shields moved that the duties of a first-aid man are to do something intelligently and efficiently between the time of the accident and the time the injured man is placed in the hands of the physician, surgeon or hospital. Seconded by Dr. Halberstadt. Carried.

Dr. Kennihan made the motion, that Questions Nos. 2, 3, and 4 of Schedule B, be incorporated in one question and that the Red Cross system of first-aid training should be adopted as the standard. Seconded by Mr. Judd. Carried.

Dr. Rountree made the motion, that a committee of three be appointed to formulate a resolution on Question No. 4 to present to the Conference on September 25th. Seconded by Dr. McKee. Carried. Doctors M. J. Shields, W. S. Rountree and J. J. Rutledge were appointed on this committee and submitted the following resolution, which was adopted by the Committee on First-Aid Training:

Resolved—That successful first-aid work at mines must have the personal interest of the company officials, the financial support of the mining company, co-operation of the mine physician, surgeons and employees.

Dr. Halberstadt made the motion, that every mine should have a sufficient number of first-aid men on duty to take care of any injured persons throughout the 24 hours of the day. Seconded by Dr. Rountree. Carried.

Committee on First-Aid Contests.

Recommendation No. 1.Relative Merits of Contests and Exhibitions:

The committee favours contests as opposed to exhibitions for the larger companies having a great many mines, and believes that intra-company contests are to be preferred, while for the smaller companies operating only one or two mines, inter-company contests are preferable.

Recommendation No. 2.—Standardization of Methods of Judging, Number of Judges, Methods of Marking, etc.:

The committee recommends that the method of judging should be by a system of discounts, the following discounts to prevail at all contests:

1. For not doing most important things first...	.02
2. For captain's failure to command men properly	.02
3. For slowness in work	.02
4. For failure to entirely cover the wound	.02
5. For wrong artificial respiration	.02
6. For loose splint	.02
7. For not padding splints properly	.02
8. For loose bandage	.02
9. For bandage too tight	.02
10. For "granny knot"	.02
11. For awkward handling of patient on stretcher	.02
12. For lack of neatness	.02
13. For assistance lent by patient	.03
14. For tourniquet too tight	.03
15. For failure to stop bleeding	.05
16. For not treating shock	.05
17. For failure to be aseptic	.10

The judges should be of sufficient number to that one judge should not handle more than three teams, preferably less, and these judges should rotate. These judges should be first-aid men and surgeons, and each contest should consist of not more than five events.

Recommendation No. 3.—Proper Rating for Speed: The committee recommends that in all contests, speed should not be an essential element, but that a certain time should be allowed to each event. Failure to finish in the allotted time should be discounted 1 per cent. for each minute over time.

Committee on Hospitals and Safety Stations.

The resolution on hospitals and safety stations is the result of a joint action by said committee and the Committe on First-Aid Training, as follows:

Resolved.—That, in the opinion of the committee underground surgical hospitals are unnecessary, but that there be deposited at different points in the mine a sufficient number of first aid packages properly equipped with first-aid emergency dressing. That, in addition, there be located central first-aid dressing stations at the bottom and immediate surface opening of the mine.

THE BATHURST IRON DEPOSIT, N.B.

(Continued from last issue.)

Concentrating Mill.—The ore discharged from the elevator is flushed into a series of trommels by a heavy stream of water. There are four of these trommels or revolving screens to classify the ore into five sizes: oversize of 1¼-in., ¾-in., ½-in., ¼-in., and undersize of ¼-inch. The easiest plan of following the course of the ore in the mill is by reference to the accompanying flow sheet, by which it is seen that the oversize of 1¼-inch is divided up between three compartments of the large 900-B jigs. The oversize of ¾-inch is also divided up amongst three other compartments of other 900-B jigs. The concentrates produced by these six compartments are discharged on a concentrates belt conveyor. The tailings from these six compartments are dewatered and run through a set of Traylor rolls 42-inch diameter, 16-inch face, set to ⅜-inch opening, thence elevated by a rubber belt elevator with steel buckets attached to the third tremmel where it joins with what is left of the original feed and here classified for further jigging. The oversize of the ½-inch consisting partly of primary feed and partly crushed tailings pass to No. 4 900-B jig, the concentrates removed and the tailings retreated on one compartment of No. 5 900-B jig, the tailings from thence passing to No. 7 jig, a three compartment Hartz. The oversize of ¼-inch goes to the second compartment of No. 5 900-B jig, the tailings from which are also retreated on No. 7, 3 compartment Hartz. The undersize of ¼-inch is treated on No. 7 and No. 8, both 4 compartment Hartz jigs. The hutch product and concentrates of the last compartments of these jigs are considered as middlings, and are flushed to the return elevator and thence to the ½-inch trommel, and so return through for a second treatment. A complete description of the above jigs will be found in the Nictaux Concentrating Plant, in this issue.

In general, all ore is treated twice, that is, the tailings from the primary treatment are retreated to reduce the loss to the smallest quantity.

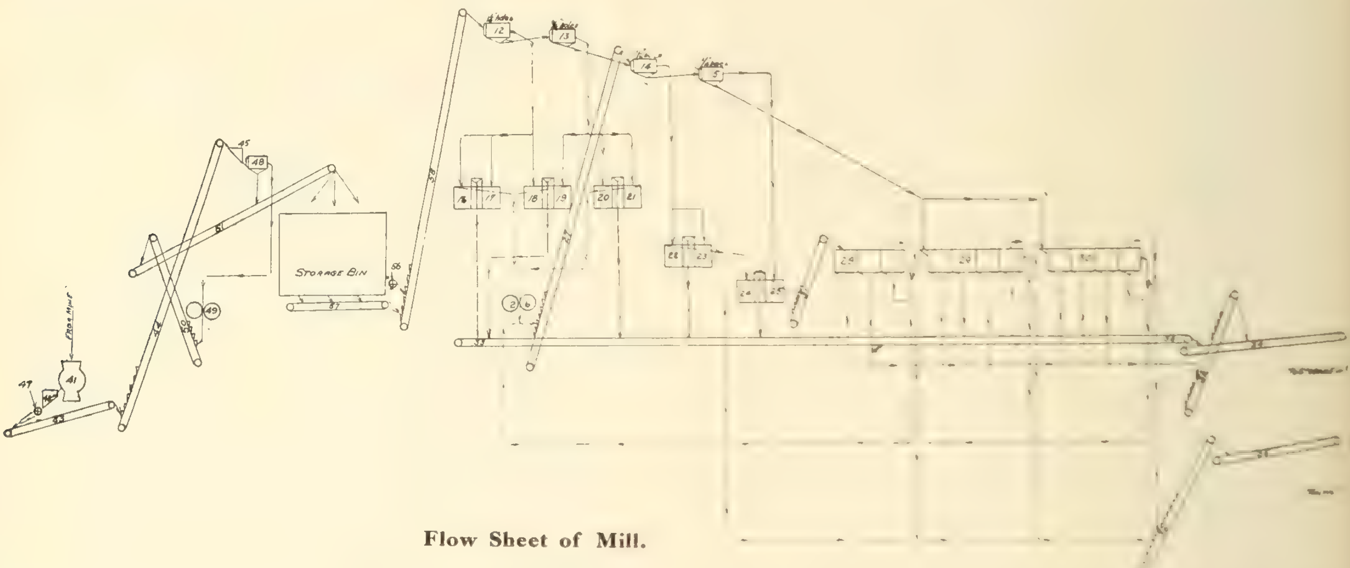
The ore is almost black in colour and the rock has the same colour, consequently there is no colour line between the concentrates and gangue. Further the specific gravity of the rock is very nearly the same as the concentrates, making it difficult for the jig man to observe either by sight or feel whether he is jigging to the best advantage. For this reason it has been found necessary to feed an absolutely uniform feed of ore into the mill; the jig man then has only to reject a fixed quantity of tailings. Tests were made to determine this point, and it is also necessary to keep a very careful check on what each particular jig is doing by analysis of concentrates and tailings; each jig is tested every second day, the record being kept on the monthly mill sheet which is similar to the one shown for the Nictaux mill.

The average iron content of the run of mine ore mixed with rock is about 45%. With the mill producing a 50% concentrate, it was found that a large portion of the tailings, which were being wasted ran 46% iron. On this account a slight re-arrangement of the flow sheet is being made, by which No. 7, the 3-compartment jig becomes a primary jig, and No. 5 becomes a secondary jig, the concentrates from which are run to an extra belt conveyor to a second grade stock pile of 46% ore. It is expected that this will effect a very considerable economy in the quantity of tailings discarded.

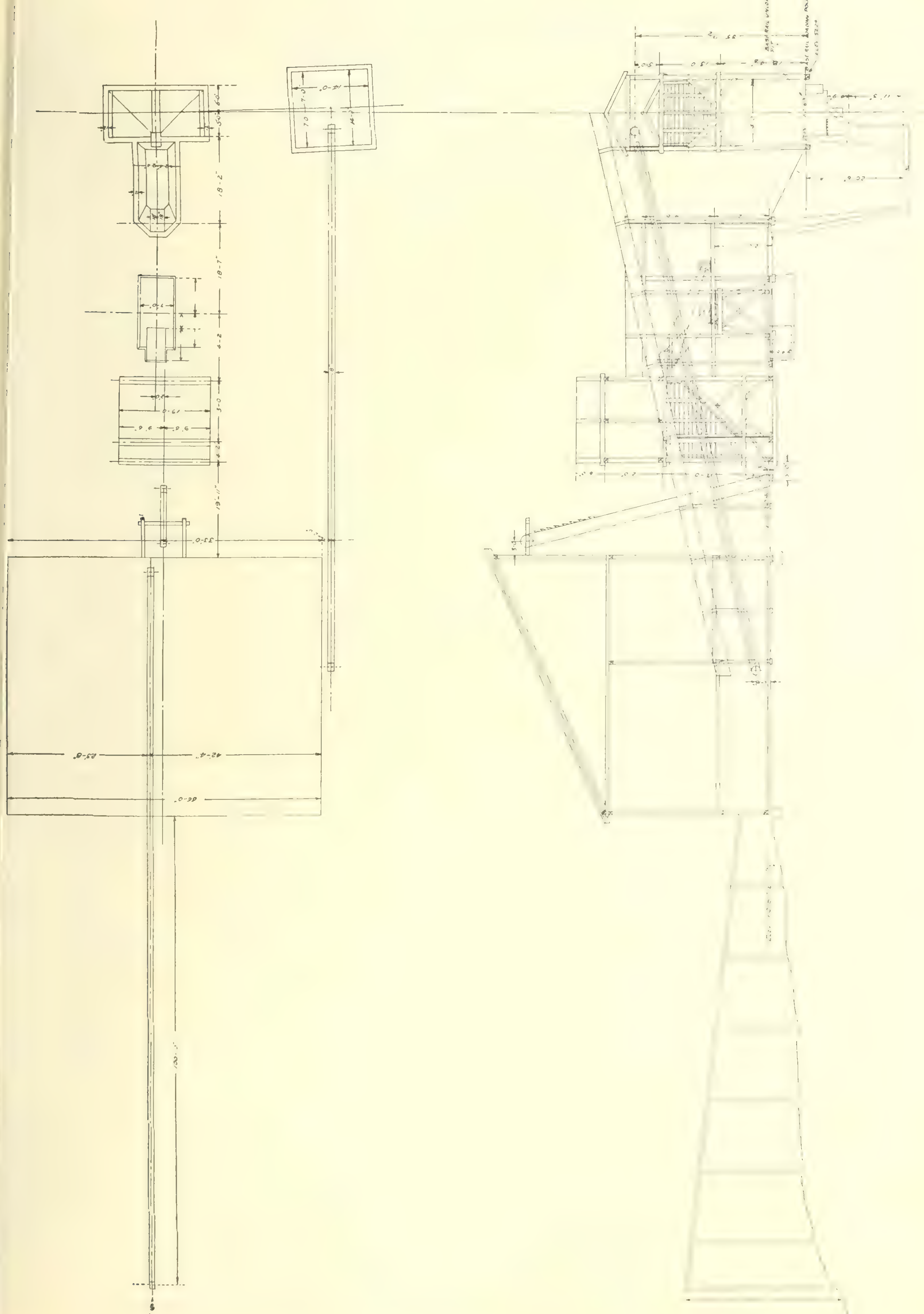
This mill has the same system of circulating water as the Nictaux mill, the water being used over and over again in quantities of 2,000 gallons a minute, while 500 gallons per minute of fresh water is added to maintain a certain degree of purity. This fresh water is pumped to the top of the mill into the trommel housing by a Knowles 12x12x10 in. duplex steam pump, while the circulating water is handled by an 8-inch single stage American Well Works centrifugal pump this circulating water being elevated from the settlings tanks in the basement to a large launder located just above the highets jig level.

Concentrates are conveyed to the loading pocket by an 18-inch belt conveyor, while the tailings are handled on a 16-inch conveyor.

The machinery in this mill was designed and erected by the American Concentrator Co., of Philadelphia and Joplin, and is designed to treat 70 tons crude ore per hour. The mill is operated by an 18x20 inch Robb Corliss engine running at 150 r.p.m.



Flow Sheet of Mill.



Layout of Concentrating Plant.

BRITISH COLUMBIA.

(Specially Written for the Canadian Mining Journal.)

On September 17, 18, and 19, Kamloops, B.C., held a "Centenary Celebration," and included in the proceedings a "Grand Historical Pageant, representing the progress of events since the first white settlement was founded at Kamloops in 1812." Knowing that there would be at the celebration a number of old-timers from the Fraser and Thompson Rivers, which were the scenes of the great gold excitement in British Columbia in the early sixties, with characteristic thoughfulness and spontaneity, the premier, (Hon. Sir Richard McBride), who is also minister of mines for British Columbia, had prepared a pamphlet for free distribution, primarily among the old-timers, a 16-page pamphlet, to which has been given, on the happy suggestion of Mr. R. F. Tolmie, deputy minister of mines, the title of "The Days of Old and Days of Gold in British Columbia," this pleasantly recalling the well-known old song of "The Days of '49."

The brief "introductory" is as follows: "The information given in this pamphlet is not, by any means, a connected history of placer-gold mining on the Fraser River and tributary streams, the richest of them, in the golden days of the early sixties, having been streams in the Cariboo country. It is rather, generally, a somewhat disconnected series of excerpts from published accounts of placer-gold mining in the province, reprinted with the chief object of again directing attention to the great riches that were recovered, from the gold-bearing gravels of the various streams mentioned, during the years immediately following the time when British Columbia was very much what has been described as 'theMainland solitude.' "

Early Discoveries.

Concerning the early discoveries of gold in British Columbia, this account is reprinted:

"The early discoveries of gold in small quantities range between the years 1850 and 1857. In 1850 specimens came from Vancouver Island and Queen Charlotte Islands. An incipient mining boom took place at Queen Charlotte Islands in 1851 and 1852. Dr. Geo. M. Dawson said that from one little pocket or seam in Gold Harbour, Moresby Island, between \$20,000 and \$75,000 was reported to have been taken. It has been stated by others that more gold was lost in the harbour in the operation of mining than was recovered. However, much or little, the 'find' ended there. About the same time Indians from up Skeena River brought pieces of gold to the Hudson's Bay Company's fort, but the several expeditions to find it in places ended in failure. In the interior, gold was found as early as 1852, and in 1854 Colville Indians were known to have had nuggets in their possession."

Gold in Many Places.

Next come extracts, most of them from Bancroft's "History of British Columbia," giving information of reported discoveries of gold in various parts of the province. One in 1858, is that "Chief Trader MsLean procured gold dust from the natives of the vicinity as early as 1858," since which time more or less gold has been received from the natives at that and other posts, though not in sufficient quantities to awaken a suspicion in the minds of the traders that paying diggings existed in the country." Mr. Gavin Hamilton, of Lac la Hache, Cariboo, a veteran of the Hudson's Bay Company's service, "is absolutely certain that gold was discovered in the Thompson River during the season of 1856, because Mr. McLean, at Kamloops, had two pint pickle bottles half full of gold taken from the river that year." Then follow references to Governor Douglas, who late in 1857 and early in 1858, advised the colonial office in England of "the discovery of gold within the Coteau embraced by the Fraser and Thompson Rivers."

Next, Bancroft is quoted, thus: "And here begins the infection which spread with such swift virulence in every direction. It is noised abroad that gold abounds in British Columbia. Then men everywhere throughout the world begin to study their maps, to see where is situated the favored isle that guards the auriferous mainland. California is to be outdone, as the rivers of British Columbia are larger than those of California. The glories of Australia shall pale before this new golden Aurora Borealis. The first load of 450 adventurers left San Francisco on April 20, 1858. Between April 20 and June 9, 2,500 miners mostly from the interior of California, had taken passage by steamer from San Francisco; and it is estimated that 5,000 more at the same time collected in Puget Sound, on their way to the Fraser." Later, Bancroft makes reference to "the 20,000 who went to Fraser River from California in 1858." The greatest number were employed between Hope and Yale, but among the best diggings were those at Fountain, six miles above the great falls, and for some time the northern limit of mining. Gradually the miners worked their way higher up the Fraser, past the junction of the Thompson with the Fraser at Lytton, to Cayoosh and Bridge Rivers, at Lillooet, then to Chilkoten, and thence on past Fort Alexandria to the mouth of the Quesnel. "Late in the season of 1859, definite reports came that the search for gold had proved successful at Quesnel, and in 1860, by the time the pioneers of the column reached Antler Creek, 600 white miners were said to be engaged on this river, making from \$10 to \$25 a day, and occasionally turning up nuggets weighing from 6 to 8 oz. each."

"Golden Cariboo."

"Turn we now to Cariboo—Golden Cariboo—which might appropriately be termed the cradle of British Columbia, as it was the gold rush there in 1859 that raised it from the position of a 'fur' country to the dignity of a colony, and finally a province." From this on are extracts giving information relative to discoveries on Keithley, Harvey, Antler, Cunningham and Grouse creeks; Bear and Willow Rivers; and William, Lowhee and Lightning Creeks. One extract runs thus:

"The Fraser excitement was never a more universal topic of conversation in California than was Cariboo at Victoria in the autumn of 1861; it seemed hardly credible, even to those accustomed to see rich diggings and lucky strikes. The news spread farther, and thousands of people from California, Canada, England, and every other quarter of the globe ascended the valley of the Fraser early in 1862. Owing to the unexpected distance, and the difficulty of reaching Cariboo before the completion of the wagon road, many turned back without entering the mines; while others consumed on the way provisions intended for the re-

lief of those who had wintered in the mines, consequently there was almost a famine at Cariboo. Exploration in 1862 was, nevertheless, vigorously prosecuted by an actual mining population, estimated at 5,000 in Cariboo district. Although extending over an area of 50 miles square, the operations were chiefly on contiguous ground, and resulted in the production of a total yield from Cariboo thus far of about $3,000,000.

"Boys, This is Lightning."

Space restrictions prevent quotation of many particulars of the fabulous yields of claims on William Creek; of the story of the naming of Lightning Creek, after Bill Cunningham had exclaimed, when descending its steep banks, "Boys, this is lightning," and of other fascinating glimpses of life on the creeks in the "days of gold." This brief summary has been taken from the "Annual Report of the Minister of Mines, 1874."

"It is impossible to estimate correctly the amount of gold that has been taken out of William's Creek during the last ten years. But the annexed return of the yield of a few of the claims in Cariboo in 1861-'62-'63-'64, will serve to illustrate the enormous value of the gold deposits of the district.

"Antler Creek, in 1861, for some time, yielded $10,000 a day. About $1,000 was taken out of a sluice-box for one day's work. Steele's claim, on William's Creek, gave a maximum yield of 400 oz., or $6,524 a day. More than $100,000 was taken out of this claim of 80x25 feet.

"In 1862, the highest amount taken out by any one company in 24 hours was $9,050. This was from the Cunningham claim on William's Creek, which realized at the rate of nearly $2,000 a day for the season; on several days as much as 53 lb. weight of gold was taken out. The Adams claim yielded to each of its three partners $40,000 clear of expenses. In the Barker claim, eight partners realized $7,000 each. These claims were above the canyon. In 1863, three claims below the canyon yielded $300,000; Diller's claim in one day the extraordinary sum of 102 lb. of gold—$20,000.

"In 1864, many of the claims continued to pay as well as before. On Conklin's gulch, a discovery of that year, the Ericsson claim yielded from 400 to 500 oz. a day. The Butcher claim on Lightning Creek, yielded 350 oz. a day; the Aurora, from 300 to 600 oz.; the Caledonia, 300 oz.; and the Wake-up-Jake, 150 oz. These few returns are given merely to illustrate the wealth of Cariboo, and in no way describe the amount of gold taken out over the whole district; only that from a few claims selected for illustration."

Some Cariboo Rhymes.

After giving a list of prices current in 1875, attention is turned to "Sawney's Letters and Cariboo Rhymes," by James Anderson. "For the Sake o' Auld Lang Syne," some of these are reprinted in the pamphlet, including excerpts from "Letter No. 1," written February, 1864; "The Prospector's Shanty"; "Letter No. 3," and "Waiting for The Mail." Among other references in these rhymes that awaken memories press," faceitiously named, "Barnard's Cariboo Express," facetitiously named, "Barnard's Cariboo Delay."

The closing part of the pamphlet deals very briefly with "The Cariboo of To-day," and in this an estimate is given of the aggregate value of the gold produced in Cariboo to date, namely, nearly $41,000,000. Mention is made of recent installations of hydraulicking plant and works, one having involved an outlay of more than $1,000,000, as evidence of the confident expectation of continued profitable production from the gold-bearing gravels of Cariboo district.

Suitably Illustrated and Well Printed.

The pamphlet is illustrated with half-tone reproductions of photography of Fraser and Thompson River views, and Cariboo mining scenes, the latter including several old ones—in particular the "Cameron Claim, William's Creek, 1863," and "Old Black Jack and Burns Hydraulic, Cariboo, 1863," The dark-coloured cover is lettered in gold, and is especially appropriate in appearance as a cover for "A Few Reminiscences of the Early Gold Mining Days." In each copy has been placed a book-marker, on which is printed: "With the Compliments of Richard McBride, Minister of Mines, Victoria, B.C."

A further kindly remembrance by the Hon. the Prime Minister is of the inmates of the Old Men's Home, Kamloops, Sir Richard having arranged that each of them should be supplied with a copy of the pamphlet. Mr. R. F. Tolmie, deputy minister of mines, who had been at much pains to obtain suitable reading matter and illustrations for the pamphlet, went to Kamloops to represent the minister of mines at the Centenary, since it was not practicable for the minister to attend himself.

SYDNEY PRESSED BRICK COMPANY, LIMITED.

By H. C. Burchell, Managing Director.

The Sydney Pressed Brick Company is manufacturing what may be described as artificial stone from granulated blast furnace slag and a small percentage of slag cement. The granulated slag is obtained in railway hoppers from the Dominion Iron & Steel Co. Part of the moisture is driven out of the slag in a rotary dryer and the proper proportion of cement is then added.

The slag and cement are thoroughly mixed and ground together and pressed (damp) in a machine

View of Sydney Pressed Brick Company's Plant

such as is used in the manufacture of sand-lime bricks. From the press the bricks are taken on small iron trucks to a curing cylinder in which 20,000 bricks are cured for eight or ten hours in steam at about 100 lbs. pressure.

On coming from the curing cylinder the bricks have a good ring and are fit to be used. They, however, go on hardening for an indefinite time, and are improved by exposure to weather and changes of climate. They make an exceptionally strong bond with cement mortar. A wall built of these bricks laid in cement mortar is practically monolithic. The bricks are quite free from warp and are very accurate in dimensions. The dimensions are 8 3-16 in. x 4 in. x 2 3-16 in.

The company manufactures light grey, red, and yellow bricks. The new general office building of the Dominion Iron & Steel Company is built of Sydney red bricks. Various commercial, industrial, educational buildings, and dwellings in Sydney and elsewhere furnish very attractive examples of this new building material.

The output of the whole plant is 20,000 bricks per working day of ten hours.

MARITIME RAILWAY & POWER CO., LTD.

Written for the Canadian Mining Journal by G. B. Burchell.*

This company operates the most northerly coal areas in Nova Scotia. This means that their collieries are nearer the large consuming points than any of the rival companies.

The areas held by this company consist of 26 square miles, containing 500,000,000 tons of coal on the northern outcrop of the Cumberland Basin. The southern outcrop of this Basin is being worked by the Dominion Coal Company at Springhill.

Scene at Joggins Colliery

The most important colliery operated is situated at Joggins Mines, which is a seaport on the Bay of Fundy. This mine is equipped for an output of 1,000 tons per day, the ventilating, pumping, coal cutting, and haulage being all done with electric motors, which receive their current from the company's power plant situated at their Chignecto colliery fifteen miles distant.

In addition to the facilities for water shipment at Joggins Mines, which consist of pockets capable of handling 1,500 tons per day, the company has its own line of railway, 15 miles in length, which serves to connect all the collieries with the docks at Joggins Mines and Maccan Junction on the Intercolonial Railway. This junction is the closest in Nova Scotia to the large markets available in Amherst, Sackville, Dorchester, Moncton, and St. John.

Moncton is the headquarters of the Intercolonial Railway and the future terminus of at least two trans-

Coal Dock, Joggins Mines

continental railways. At the present time Moncton distributes over one million tons of coal annually and this one market would absorb the entire output from the collieries of the Maritime Coal, Railway & Power Company, were it available.

Power Plant.

The power plant of the company is situated at the Chignecto Colliery, which is only eight miles from the city of Amherst, where a large amount of power is consumed for manufacturing and lighting purposes. Among the manufacturers who are using the power might be mentioned, The Canada Car and Foundry Company, the Robb Engineering Co., the Amherst Boot & Shoe Co., and the Hewson Woolen Mills, while a ten-year contract is being filled for the city street lighting.

The capacity of the company's generators is now about 2,000 h.p., and plans are being drawn up for an addition, which will bring the capacity up to 5,000 h.p.

*General Manager.

EXPLOSIONS FROM FALLS OF ROOF IN COAL MINES.

A most interesting paper explaining the cause of the three explosions at the Bellevue colliery in Alberta, has been submitted to the Institution of Mining Engineers by Mr. John T. Stirling Provincial Inspector of Mines, and Prof. John Cadman. The facts presented illustrate how explosions of considerable magnitude may originate from causes which heretofore have not been reckoned with. By way of introduction the authors point out that the investigation which necessarily follows an explosion is always difficult, and usually hazardous, and although the point of origin may frequently be located within narrow limits, the exact source is often obscure; obscure no doubt, because the investigators are limited in their choice of the igniting agent to the ordinary sources of heat which appeared likely to be forthcoming at the time when the ignition took place. In other words they commenced their investigation with preconceived ideas concerning the origin of the explosion.

The writers adduce evidence to show that the explosions at Bellevue were produced by the ignition of inflammable gas by sparks emitted from falling stones. A few of such cases have already been recorded, but the importance of this source of ignition cannot be lightly disregarded. In the removal of pillars—in the board and pillar working as practised in the north of England—a glow has been observed on such occasions in the goaf when the roof has fallen in, and cases are known in which gas has been ignited from the spark from a pick. The four seams at the Bellevue Mine are known as Nos. 1, 2, 3, and 4, and are intersected at distances 135, 258, 350, and 500 feet respectively from the mine entrance. The explosions occurred in No. 1 seam, which has an approximate thickness of 13 feet, a hard siliceous roof, and has been extensively developed. The method of working was that of driving wide rooms to the rise, and such portions of the ribs extracted as could be obtained before the roof collapsed, or showed signs of collapse. The roof, as stated being of a hard siliceous nature, wide openings were thus left in the waste. Three explosions occurred in the mine in 1906, and were traceable to direct ignition from open lights prior to the introduction of safety lamps in August of that year. No further explosions took place until October, 1910, which was the first of the series of three described by the writers. When this explosion occurred it happened to be "Labour Day," and work having been suspended, no one was in the mine. Subsequent examination revealed that the explosion had originated in the neighbourhood of shoot 71, and that immediately above the counter gangway pillar between shoots 61 and 71, a large fall of roof had taken place. This cave was about 4 feet thick, and extended to the rise for a distance of upwards of 80 feet. The evidence in fact indicated that this fall was the point of origin. Thus according to information supplied by Mr. Elijah Heathcote, the District Inspector of Mines, there was no sign of the explosion at the entrance to the mine, and it was not until shoot 14 was reached that any evidence of the explosion was manifest. From shoot 14 in-bye, all the electric lamp bulbs showed a thick coating of mud and dust, and several were broken. Tubs were coated with from 2 to 3 inches of mud, plastered all over the in-bye side. In the neighbourhood of shoot 58, evidence of out-bye force was found, props were displaced and material dislodged. At shoot 65 much disturbance appeared, and at the bottom of and in shoot 67 evidence of flame was visible in the form of coking on the in-bye side of the props. From shoots 67 to 71 there was much evidence of flame, and other evidence corroborates Mr. Heathcote's view concerning the point of origin of the explosion. Although Mr. Heathcote at the time boldly advanced the opinion that the occurrence was attributable to an ignition caused by sparks produced from falling roof, neither the management nor the mining public were inclined to accept the theory and the cause of the explosion was generally regarded as shrouded in mystery.

The next explosion occurred during the afternoon shift of December 9th, 1910. At the time there were forty-seven persons underground, and of these thirty were killed, together with one of the rescue party wearing a Draeger apparatus. This latter fatality is believed to have been caused by a leak in the joints of the apparatus. Meanwhile from an examination of the mine after the explosion by one of the writers, it appeared quite clear that this explosion originated in the locality of shoot 74. At the top of this shoot, and extending for some distance, a large fall of roof had occurred. At this point there is every opportunity for an accumulation of gas, and, given a source of ignition here an explosion of fire-damp would account for all the phenomena observed. At the public enquiry into the cause of the explosion, the jury, for want of a more definite conclusion, favoured the view of one mining engineer who suggested that the explosion was due to what he termed his "percussion" theory, a suggestion which the writers' declare may be dismissed at once as it will not bear "the most slender investigation." They add: "In the first place, there was no evidence to support such a theory, even if such a mode of origin were possible. . . . There is no doubt that the explosion was caused by an ignition of fire-damp, ignited by sparks emitted from the falling roof."

A third explosion occurred towards the end of January, 1911, when the mine was closed on account of a general strike. An examination revealed that the explosion had originated from the neighbourhood of rooms 89 and 90. At this point a heavy fall of roof had occurred, and the area was a very suitable one for the accumulation of gas during the time the fan had been standing. The writers made a careful examination of the workings some months later, and after referring to the force of this explosion which was more pronounced on this occasion than on the previous ones, state that at the seat of the ignition ample evidence of flame was obtained, as also evidence of pitting in the form of globules of coke-dust splashed up against timbers radiating from this area. Although the writers do not attach much weight to this, it is worthy of note, particularly as the general evidence of direction clearly pointed to this place as the starting point, and they have observed similar pitting of coke-dust around the area of ignition of fire-damp in other cases.

To prove the correctness of their theory the writers carried on some experiments in the mine. A large piece of rock from the roof, weighing some 60 or 70 pounds, was lifted and dropped into one of the shoots, on the floor of which lay some of the fallen roof. As the lump rolled down the shoot, a brilliant display of sparks was observed. Other experiments demonstrated that sparks from this rock could be produced of suf-

ficient intensity to ignite coal-gas. The rock is a bituminous sandstone, very fine and even in texture, giving the whole a dark grey colour, laminated thin layers of black occurring in it, along which it splits most readily. A hand specimen roasted in a clear gas flame for some minutes yielded on one side patches of glossy black coke, whilst on the other side the black colour had been discharged, leaving a pale grey fine-textured sandstone. The rock under the microscope shows a fairly grained texture, and consists chiefly of colourless grains, chiefly quartz. The brown grains, perhaps a sixth of the rock mass, seem to be of carbonaceous material which exert no action upon polarized light. The blackest grains are doubtless bitumen and have clearly yielded under pressure. Several samples of mine air were taken and on analysis showed the presence of fire-damp, and one sample showed the presence of 0.30 per cent. methane. The writers' remark on this as being specially interesting, for as the ignition temperature of the paraffin hydro-carbons appears to fall slightly as the series ascends, the presence of this higher hydrocarbon in the fire-damp would lower the temperature of ignition, and thus render more easy the ignition of gaseous mixtures by sparks from falls of roof.

The paper concludes as follows: "It is clear, however, that sparks of sufficient intensity can be produced by rubbing together pieces of the roof of No. 1 seam to ignite methane, which has an ignition temperature—according to Dixon and Coward—of from 556 to 700° C., and as other hydrocarbons have been shown to be present, the temperature of ignition will be less, and an explosive mixture will be more readily ignited.

"Wheeler and Burgess, in their research on "The Lower Limit of Inflammation of Mixtures of the Paraffin Hydrocarbons with Air," showed that the length of the spark necessary to ignite the lower-limit mixtures was not material, provided that the temperature was adequate.

"By the abrasion of two surfaces of the rock in question, it appears that a definite amount of energy has to be exerted before sparks of sufficient intensity can be produced to bring about ignition. The writers are satisfied, however, that they have established the fact that sparks can be produced by falls of roof in the No. 1 Bellevue seam sufficient to bring about the ignition of inflammable gas; and as subsequent examinations after each explosion showed that falls did occur, in which large masses of the roof fell, in areas where gas was in all probability present, it seems perfectly clear that the cause of the three explosions at Bellevue has been satisfactorily explained.

"To avoid such calamities in the future is a very difficult and serious problem. The present method of working lends itself to irregular falls in open and ill-ventilated goaves. It is impossible in the present method of working to prevent falls in the open goaf, and it is further practically impossible to ventilate satisfactorily all the goaf-spaces under the system in operation prior to these explosions. A method is now being adopted of putting shoots through to the surface at frequent intervals for the purpose of freeing the upper goaf-areas of inflammable gas. Such a method is applicable only during such time as outcrop-workings are in progress, and at the most can only be said to be a temporary expedient. A form of working which permits of the filling of the goaf-space appears the most satisfactory solution of the problem. Although a practical solution of the difficulty, the introduction of such a method is connected with commercial questions which it is not the intention of the writers to discuss.

It is well known that the origin of a number of explosions in this country and elsewhere has remained obscure, and whilst it is not suggested that sparks from falling roofs are by any means common, it is a subject which deserves the serious attention of all employed in mining."

A DRILL CONTEST.

During the latter part of 1911 an iron mining company, operating a number of properties in the northern part of Hastings County, Ontario, arranged to run a test between a number of the best known makes of rock drills on the market. This trial was to consist of records of footage drilled, cost of repairs, ease of operation, and tests of air consumption. The air pressure at the compressor was to be about 100 pounds per square inch, which pressure was to be maintained. The manufacturer or agent of the drills entering the trial would have the privilege of furnishing a man or men accustomed to operating his drill, which men, however, were to be under the supervision of the company. The drill was to be a standard machine throughout and the manufacturer was to submit tenders to cover a number of drills as specified and agreed on, and to quote prices on drills, mountings, and parts that would hold good for two years from the acceptance of the tender. The pistons of the drills were to be preferably equipped with a Quick Acting Chuck which was to take the steels unshanked.

The Sullivan Machinery Company, of Chicago, Ill., manufacturers of the Sullivan Drill; the Canadian Rand Company, of Sherbrooke, Que., manufacturers of the Little Giant Drill, and Mussens Limited, of Montreal, agents of the Holman Drill, manufactured by Holman Brothers, of Camborne, Cornwall, England, were invited to enter this trial. These three companies agreed to the conditions laid down by the company, and placed drills in the contest.

The original intention of the company was to use a light drill, either 2¾″ or 3″ diameter cylinder. With this understanding Mussens Limited sent a 3″ Holman, while the Rand sent a 3⅛″ diameter machine. The Sullivan sent a 3¼″ size drill. The Holman and the Rand Drills were the only machines provided with the Patent Chuck as stipulated in the conditions, the Sullivan having the old-fashioned chuck.

When the drills were placed at work the 3″ Holman machine was found to be somewhat light, and a 3¼″ machine was, therefore, sent to replace it. Owing to the changes and other unavoidable delays the competition did not start until April 1st, 1912, the final entries being:

Sullivan, 3¼″ Spool Valve Drill, with the ordinary Round Chuck.

Rand, 3⅛″ Tappet Valve Drill with a Patent Chuck.

Holman, 3¼″ Ball Tappet Type Steel Drill with a Patent Chuck.

The Holman 3″ Drill was also left on the property to try out.

The contest went on for six days, when the Rand 3⅛″ machine was brought to the surface as it was apparently

found the Patent Chuck was not working satisfactorily. The Rand Company was notified to send a 3¼″ machine to replace but owing to the non-arrival of this 3¼″ machine the Canadian Rand Company was not represented for some days.

On account of climatic and local conditions, the air was found to be very damp, and the Sullivan runner had some trouble with the valve of his machine freezing. On account of this trouble a Sullivan Tappet Drill was ordered, but unfortunately, when it arrived the piston was

On May 3rd, another piston with the ordinary old type chuck arrived at the mines and the 3⅛″ Rand was again put in commission.

On May 14th, the test officially came to an end. During the time from April 1st to May 14th, the drills were tested as to the amount of air consumed per minute. This was done by meter, the drills working for a certain length of time and the flow of air registered.

The Holman 3¼″ Drill was tested eight different times.
The Rand 3¼″ Drill was tested five different times.

TABLE NO. 1

Summary of Drill contest between the Holman, Rand and Sullivan Rock Drills at the Iron Mines, Bessemer, Ont.

Dates	Shifts	Size of Drill	Footage Wet	Footage Dry	Total Footage	Stopped for repairs	Cost of Material	Labor in dollars and cents	Total cost of repairs including labor	Average footage per hour	Consumption of air per minute	Air Pressure	Saving in air effected by the Holman Drill over the Canadian Rand.	Saving in air effected by the Holman Drill over the Sullivan	Saving in maintenance effected by the Holman Drill over the Canadian Rand.	Saving in maintenance effected by the Holman Drill over the Sullivan	Per cent. greater footage effected by the Holman Drill over the Canadian Rand.	Per cent. greater footage effected by the Holman Drill over the Sullivan
TEST NO. 1																		
April 2 to May 14	40	Holman 3¼ in.	91.7%	8.3%	Feet 890½	Min 20	$1.80	.09	$1.89	Feet 3.647	Cub.ft 102	Lbs. 80	49	14.7	272	44	29.06%	28.3%
April 2 to May 14	48	Sullivan 3¼ in.	86.2	13.8%	813.7	75	2.68	.58	3.26	2.818	117	80						
April 18 to May 14	27	Can. Rand 3¼ in.	81.2%	18.8%	354	75	4.00	.76	4.76	2.843	152	80						
TEST NO 2																		
April 2 to May 14	50	Holman 3 in.	83	17	847½	90	5.05	.61	5.66	2.866	101	80	6		161		37.6	
April 2 to May 14	20	Can. Rand 3¼ in.	82.9%	17.1	310	105	5.32	.59	5.91	2.082	107.	80						

TABLE NO. 2.

TEST No. 1

Make of Drill	Size	Number of shifts	Total Labor Cost based on $4.60 per shift for driller and helper $	c.	Total Cost of Repairs, including cost of Labor making repairs $	c.	Gross total cost Labor and Maintenance $	c.	Total footage drilled	Average Labor & Maintenance cost per foot drilled $	c.	SAVING effected per foot drilled by the Holman Drill over the Sullivan Make	SAVING effected per foot drilled by the Holman Drill over the Canadian Rand
Holman	3¼ in.	40	184	00	1	89	185	89	890½		20.88	6·68 Cents	15·54 Cents
Sullivan	3¼ in.	48	220	80	3	26	224	06	813.7		27·56		
Canadian Rand	3¼ in.	27	124	20	4	76	128	96	354		36·42		
TEST No. 2													
Holman	3 in.	50	230	00	5	66	235	[illegible]	847½		27·82		3·76 Cents
Canadian Rand	3¼ in.	20	92	[illegible]	[illegible]	91	97	[illegible]	310		31·58		

found to be bent, which damage was believed to have occurred in transit. The Sullivan, therefore, continued the competition with the Spool Valve Machine.

On April 18th, a 3¼″ Rand Tappet Machine arrived at the Mines and was put into active operation. This drill was not provided with a Patent Chuck similar to the chuck on the 3⅛″ machine formerly in use, but had the ordinary old type chuck, for which steel had to be shanked. The contest was then continued to the end of April, as originally agreed, when by mutual consent between all three drill representatives, and the representatives of the company, it was decided to carry the trial on for another two weeks.

The Sullivan 3¼″ Drill was tested eight different times
The Holman 3″ Drill was tested five different times.
The Rand 3⅛″ Drill was tested five different times.

Table Number 1 is a summary compiled from the figures submitted by the company to the drill representatives. From this summary the Holman drill shows a very considerable advantage, not only in saving in air, and saving in maintenance, but also in greater footage effected. The Holman drills also showed considerable saving per foot drilled on labor costs only, as will be seen from table No. 2.

On the basis of this six weeks' competition the initial order of the company for rock drills for the Bessemer property was placed with Mussens Limited, of Montreal, for the 3¼″ Holman Steel Rock Drills.

A NEW CANADIAN COMPANY.

The C. O. Bartlett & Snow Company of Canada, Limited, has been granted a Dominion charter to deal in, manufacture, and install elevating and conveying machinery, power transmission machinery, engines, boilers, hoisting machinery, brick machinery, garbage reduction and destruction machinery, paint machinery, grain and cereal machinery, and to carry on a general line of engineering, manufacturing and construction work.

The head office of the company has been opened at 282 St. Catherine street west, Montreal, with Herbert S. Hersey, general manager.

This company is the outgrowth of the extensive Canadian business of the C. O. Bartlett & Snow Company, of Cleveland, Ohio, and, although the connection between the Ohio company and the Canadian company will be very close for some time, the organization and management are entirely independent.

The Canadian company has been granted Canadian rights to all patents and licenses owned by the Ohio company, and this, taken in connection with the vast engineering data and designs of the original company, coupled with the wide acquaintance and engineering experience of Mr. Hersey and the engineers associated with him in handling the Canadian business, places the new company on the basis of an old-established concern with years of business experience behind it and with a business reputation of the highest standard as well as a large clientelle from which to draw a substantial amount of business from the start.

The C.O. Bartlett & Snow Company has installed a number of the best and most up-to-date coal mine equipments during the past few years in Crow's Nest Pass district as well as having done a large business in connection with the cement interests of Canada and with the coal, gypsum and asbestos interests of the Eastern Provinces.

PERSONAL AND GENERAL

Mr. Arthur S. Herbert, the manager of the Siemens Company of Canada, Limited, has been appointed the representative for Canada for that company. Correspondence hereafter is to be addressed to the Montreal office, at the Transportation Building, Montreal, P.Q.

Mr. Ralph Stokes has been appointed assistant consulting engineer to the Canadian Mining and Exploration Company. Mr. Stokes, who has for years been a prominent technical writer and journalist, has visited nearly every important mining region in the world, and is intimately acquainted with the Rand.

Mr. J. B. Woodworth, mining engineer, Toronto, is in New Mexico examining several properties.

Mr. S. N. Graham has returned from a professional trip to Porcupine.

Mr. A. A. Cole has returned to Cobalt after spending a few days in Toronto and Montreal.

Mr. G. C. Bateman, who now represents the Canadian Mining and Exploration Company in Toronto, is making an examination on Vancouver Island, and will be back in Toronto about November 1st.

Mr. J. B. Tyrrell is expected in Toronto about the first week of November.

Mr. W. F. Ferrier is in Toronto after a protracted absence.

Mr. George R. Rogers, manager of the Mann Mines, Gowganda, visited Toronto on business on October 5. Mr. Rogers reports 20 tons of high grade ore ready for shipment. The silver contents are between 2,000 and 3,000 ounces per ton. The mine has been working for only nine months and is not yet fully equipped. A shipment of 14 tons was made last March when the ore ran between 3,000 and 4,000 ounces per ton.

Mr. G. M. Colvocoresses, manager of the Millerett mine, Gowganda, passed through Toronto on October 4th on his way to New York.

Mr. H. Mortimer Lamb has returned form British Columbia.

Mr. P. Kirkegaard has returned to Toronto from the Cordova mine.

Dr. Alfred E. Barlow, president of the Canadian Mining Institute, returned to Montreal last week after an absence of some weeks in Western Canada. During his stay in the West Dr. Barlow devoted much time to organization work in connection with the visit of the members of the International Congress to British Columbia next year. He also presided at the semi-annual meeting of the Institute at Victoria on September 18th and 19th and at Frank, Alta., on September 30th.

Mr. Charles Fergie left recently on a visit of inspection to the collieries of which he is consulting engineer at Lethbridge, Alta.

Mr. George C. Lloyd, secretary of the Iron and Steel Institute, was in Montreal recently, coming from New York where he attended a congress of the International Association for Testing Minerals.

Mr. S. R. Heakes, formerly manager of the Kerr Lake Mine, at Cobalt, has abandoned the profession of mining engineer and has taken deacon's orders in the Anglican Church. He has been appointed to a curacy in London, Ont.

Dr. D. D. Cairnes, of the Canadian Geological Survey, returned to Ottawa the last week in September, and reports having completed that portion of the International geological work along the 141st meridian (the Yukon-Alaska boundary), which had been undertaken by the Canadian Government, the United States and Canadian geological surveys having agreed to map the geology along the boundary line from Yukon River to the Arctic Ocean, a distance of about 350 miles. This work was commenced in the spring of 1911, and by the terms of the agreement, the United States and Canadian geologists worked to the north and south respectively of Porcupine River, each extending their investigations at least two miles east and west of the boundary line. This work not only gives a geological section at that longitude through the northern half of the Yukon Plateau, the entire Rocky Mountain, and the Arctic Slope physiographic provinces, but should also assist materially in correlating the geology of Alaska with that of Yukon and British Columbia.

The Northwest Section of the American Institute of Mining Engineers opened its quarterly meeting in Spokane, Washington, on October 2.

Mr. James Ashworth, of Vancouver, B.C., has been examining coal lands on Bear River, which field is not a great distance from Fort George, B. C.

Dr. R. W. Brock, director of the Geological Survey of Canada, was in the West in September. With other officials of the Survey he attended the semi-annual meeting of the Canadian Mining Institute, held at Victoria on September 18-19.

Dr. A. E. Barlow, president of the Canadian Mining Institute, was in the chair at the first semi-annual meeting of the Canadian Mining Institute. He reached Victoria on September 16 and remained a week in that city. While there he had an interview with the Premier of British Columbia, Sir Richard McBride.

The British Columbia Copper Company is reported to have increased the wages of its miners 25 cents a day under a sliding scale basis agreed upon with the men. If the price of copper shall reach 13 cents a pound a similar further advance in pay will be given the men. The company's net profits for August are stated to have been about $36,000.

Mr. Herbert Carmichael, provincial assayer, who is also assistant provincial mineralogist in British Columbia, about the middle of September left Victoria for Tete Jaune Cache, in the Upper Fraser River district, to investigate the mineral resources of that part of the province. Aside from mica, authentic reports of the occurrence of minerals there have been very few in past years.

Dr. DeLorne D. Cairnes, of the Geological Survey of Canada, has, with the permission of the Director of the Survey, contributed a paper entitled "Some Suggested New Physiographic Terms," which paper was publised in The American Journal of Science, Vol. xxxiv, July, 1912. The table of contents is as follows: Introductory. Definition of Terms. Classification of Physiographic Processes. Equiplanation. Deplanation. Applanation. Conclusion.

Mr. W. J. Elmendorf, of Victoria, B. C., formerly general manager of the Portland Canal Mining Company, Limited, is again directing mining operations in Portland Canal district, this time as manager of the Portland Canal Tunnels, Limited.

The Engineering and Mining Journal, New York, recently published the following among other personals: Edward Dedolph has disposed of his patent rights for four European countries on his process for making zinc oxide out of low-grade zinc ore to the Metallurgische Gesellschaft of Frankfurt-on-Main, which is going to exploit it. Mr. Dedolph is at present at McGill University, Montreal, where he is engaged in research work on electric zinc smelting in behalf of the Canadian Government.

Mr. C. D. Emmons, of Eugene, Oregon, who is directing operations for a Vancouver, B.C., syndicate engaged in boring for oil on Graham Island of the Queen Charlotte group, has been spending a week or two at Victoria, having gone to that city in September after coming south. Those chiefly interested are sanguine they will find oil in commercial quantity on Graham Island.

Mr. W. F. Ferrier, of Toronto, general manager of the Natural Resources Exploration Co., Limited, who has been travelling since June in the interests of his company, reached Victoria, B.C., on September 27, and two days later left for Vancouver on his return to Toronto.

Mr. A. Gordon French late in September announced his intention to make a demonstration at Nelson, B.C., early in October in connection with his claims to have discovered metals of the platinum group in ore and dike matter occuring near Nelson. He has suggested that beside having discovered a new metal, which he has named canadium, he has found indications of still another metal at present unknown. As the provincial mineralogist was notified that the provincial department of mines might send a representative, that official took advantage of the permission thus granted and went to Nelson to ascertain what was going on. It is yet too early, at the time of writing, to learn what was done and with what result.

Mr. Joseph G. S. Hudson, of the Mines Branch of the Canada Department of Mines, went from Alberta to British Columbia in September, in performance of the duty he is engaged in, namely the collection of data for a new edition of the "Report on the Mining and Metallurgical Industries of Canada." The new edition of the report will be issued in handy form and, consequently, will be a welcome contrast to that issued two or three years ago.

Mr. F. August Heinze was in British Columbia a few weeks ago, in connection with his half interest in a comparatively large area of lands in that province granted to the Columbia & Western Railway, the construction of which line he commenced before the Canadian Pacific Railway Company purchased his smeltery and railway holdings in the Trail Creek district. The Provincial Government is stated to have purchased the C. P. R. Company's interests in the lands mentioned and it was understood that Mr. Heinze went to Victoria with the object of coming to an understanding with the Government relative to his interest in the aforementioned lands.

The Hedley Gold Mining Company has paid another five per cent. dividend, making 15 per cent. for the current calendar year. It is thought probable the company will this year make its December dividend 10 per cent., as it did last December.

Mr. Robert R. Hedley has retired from the management of the Canadian Mining Operators, Limited, of Vancouver, B.C., and will practice as a consulting mining engineer in that city.

Mr. Harry Howard Johnson, of the firm of Johnson & Hoffmann, mining engineers, London, England, has been examining mining property on Vancouver Island. It is probable his principals will undertake important development work there.

Mr. W. W. Leach, of the Geological Survey of Canada, having concluded his season's field work in the Blairmore-Frank district, southwestern Alberta, paid a visit to Vancouver and Victoria, B.C., before returning to Ottawa.

Mr. H. Mortimer Lamb, secretary of the Canadian Mining Institute, was in the West for several weeks in September and October. After the semi-annual meeting had been held at Victoria, B.C., he left there for Frank, Alberta, where preliminary arrangements had been made for holding a meeting of local members and probably organizing a branch of the institute.

Mr. Thos. J. Lloyd, underground superintendent at the Van-Roi silver-lead mine, near Silverton, Slocan Lake, British Columbia, was married on September 26, at Victoria, to Miss Mummery, an English lady who spent last winter in the home of the resident manager of the Van-Roi Mining Company.

Mr. E. C. Musgrave, who some years ago opened the Tyee Copper Company's profitable gold-copper mine at Mt. Sicker, Vancouver Island, but of late years engaged in mining in Mexico, has been paying a visit to old friends and family connections in and about Victoria, B.C. It was his intention to leave that city early

in October, on his return journey to Mexico.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Mining and Smelting Company of Canada's Centre Star, War Eagle, Le Roi group of mines, attended the semi-annual meeting of the Canadian Mining Institute, of the Western Branch of which he is this year's chairman.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, returned to Victoria late in September, after having been on a three months' trip of investigation in part of Northern British Columbia, chiefly in the Groundhog coal basin, Upper Skeena River.

Mr. James Rutherford has returned to Victoria from a visit to Great Britain. For several years he has represented in British Columbia some Old Country people who are understood to be largely interested in the Peace River district.

The Standard Silver-Lead Mining Company paid another dividend on September 9, this being the sixth this year. Last April the first dividend, totalling $25,000 was paid, and since then there has been a monthly distribution of profit at the rate of $50,000 a month, so that the total for the six months is $275,000.

Announcement has been made of the intended marriage of Dr. Alfred W. G. Wilson, of the Mines Branch of the Canadian Department of Mines, Ottawa, to Miss Russell, also of that city.

Mr. J. W. Astley and Mr. A. B. Willmott recently examined the Wilbur iron mine.

SYDNEY CEMENT COMPANY, LIMITED.

By H. C. Burchell, Managing Director.

No doubt the most important principles of modern business and industry, are efficiency and conservation of resource and by-product. Some of the industries of Nova Scotia have been most successful in applying the principle of conservation. The Dominion Iron and Steel Company use only bye-product ovens in their work, rather than the old-fashioned bee-hive ovens, and blast furnace slag from their furnaces combined with hydrated lime is now being utilized by the Sydney Cement Company for the manufacture of hydraulic cement.

Analysis of basic slag from the blast furnace:

	Per cent.
Lime	50
Silica	32
Alumina and ferric oxide	12
Magnesia	3
Sulphur	1.5

In the manufacture of Sydney cement, the first operation is the granulation of the slag. Until a few weeks ago this was accomplished by running a stream of water into the slag spout of one of the blast furnaces. The molten slag coming in contact with the water was granulated and deposited in cars in a state similar to coarse sand. Recently a granulating pit like those in use in the United States to granulate slag for the Universal Portland Cement Company, was installed. This does the work better and allows of a selection of slag from any of the furnaces. The result is a better and more uniform material.

The granulated slag is dried in a rotary dryer, put through crushing rolls, and stored in a bin close to similarly stored hydrated lime. The slag and hydrated lime are then automatically measured, mixed dry in a rotary mixer, and passed to Krupp tube mills for fine grinding. The cement is ground so that 92 per cent. passes through a 200-mesh sieve equal to 40,000 openings per square inch. The finished cement is carried away by the usual conveyors and elevators to storage bins. The packing house is equipped with Bates packing machines. The capacity of the plant is 500 bbls. per day of 24 hours.

Sydney Slug Cement Co.

This Sydney cement is somewhat slower in setting than ordinary Portland cement. On the other hand, concrete made from it continues to acquire strength for a longer period than concrete made from Portland cement. It is always perfectly sound, never swelting or cracking. The colour is nearly white with a slight lilac tone, and it has been used by some architects to obtain a very pleasing effect, when it is used as mortar in red brick work.

This cement has been found to show excellent results when used in sea water, having been found satisfactory for concrete piles, retaining walls, etc., under salt water. It is considered by local contractors to have special merit for use in stucco work and brick laying. It is also used in the manufacture of pressed brick. This Sydney cement, indeed, has proved reliable in concrete work of every description.

A LETTER FROM ATLIN, B.C.

A prominent resident in Victoria, British Columbia, recently received from a friend, writing from Atlin camp, in Sassiar district, the following notes:

I think the camp looks more hopeful than it has done for three years. Ruby Creek is showing up well. Jack Black is making good on Boulder Creek. Wright Creek boys are now in rich ground. Wm. Gairns in Upper Wright Creek is taking out half to one-and-a-half ounces per day single handed. Maluin thinks Otter Creek good enough to spend lots of money on. Spruce Creek is a winner. McCluskey is taking out wonderful gold. Geo. Adams was appointed manager on McKee Creek, vice Hamshaw, and he has had some dandy clean-ups. The first paid all expenses for the year. Old R. McKee has struck it rich on O'Donnell Creek—only in the drill hole, of course, and at 94 ft.—but he is elated with his prospects (three feet of rich pay above bedrock). Hamshaw is in again, buoyant as ever, and has raised the wind somehow. He is using the Keystone drill on Lower McKee Creek, and is sanguine, and then some.

There has been a new placer strike in Burdette Creek, a tributary of Wilson Creek, and some splendid prospects have been shown round town. The White Pass mining expert has visited the camp and says this camp has not yet begun to live. He predicts great things in the near future. How is all that for a rosy prospect?

STEAM HYDRAULIC FORGING PLANT.

(Specially Written for the Canadian Mining Journal.)

The present corporation known as the Nova Scotia Steel & Coal Company, Limited, had its birth as a country forge shop with a capital of four thousand dollars. The steady growth from this small beginning up to the large company of to-day with its iron and coal mines, lime quarries, steel works, rolling and finishing mills, and fourteen millions of capital, is one of the most interesting and illuminating stories of Canadian industrial evolution.

The company has always specialized in heavy forge work and has quite recently installed an entirely new plant for this purpose. The older equipment which was replaced consisted of large and small steam hammers. The large steam hammer has never been perfectly satisfactory for the production of the massive, intricate forgings demanded by modern industry. Nasmyth, who invented the steam hammer in 1833, revolutionized the forging process of his day. With the enormous development of engineering generally and in shipbuilding and naval armament particularly, the hammer became less and less able to produce the results required. The hammer gave such a quick hard blow that its effect did not penetrate far enough below the surface of the piece being worked and the shock caused excessive vibration with the consequent large amount of wear and tear on the parts of the machine.

In 1860 a hammer was installed at the Krupp works, at Esson, Germany, with a 50-ton ram and a 1,000 ton anvil intended for heavy forgings. Even as late as 1901, a 125-ton hammer was set up at the works of the Bethlehem Steel Company in Pennsylvania, but it was discarded after only a few months of operation.

The desirable thing in making large forgings is to get penetration in working the red-hot pieces of steel. The action of the heaviest steam hammer on a large piece, produces only a comparatively slight skin effect. This causes the steel to have a much different character on the outside from what it has in the interior. The action desired in shaping a massive forging from a bloom or ingot is a kneading action which will penetrate to the centre. This kind of working tends to produce a fine crystallization throughout and a uniformly tough, ductile finished piece of work. It has been demonstrated that forgings made by hammering are subject to all sorts of internal strains, due to differences in compression and differences in cooling. When such a forging is cut as for making a key-seat, a distention of form follows as the result of certain stresses that have been released. A large forging requires a pressure great enough to penetrate to any part of the great mass of metal, so that the flow of metal resulting shall take place uniformly throughout. Such a flow requires time and a pressure that cannot be obtained by a quick hammer blow, however often repeated, thus the hammer does not produce the same effect as does the persistent pressure of the hydraulic forging machine.

A machine was invented to give just such a kneading action as is most necessary in heavy work, and this was called a forge press. In this machine the hot pieces of steel is subjected to enormous hydraulic pressure which acts more slowly than the lightning-like blow of the hammer, but which squeezes and deforms the piece throughout. Among the first of these presses to be brought into use was the one constructed at the Armstrong works at Newcastle-on-Tyne in England in 1860. These forge presses have been found to be most efficient for heavy work and have been built in enormous sizes.

Recently there has been developed a machine which combines the good qualities of both the steam hammer and forge press. In this machine the blow is struck with the "tup" as in a hammer, and then the blow is followed up by applying hydraulic pressure and thoroughly kneading the piece as in a regular press. In this apparatus, steam pressure actuates the "tup," or striking piece, which thus moves with the speed and force of a steam hammer, while constant hydraulic pressure of high intensity may be applied at any stage of the stroke by a large water cylinder. The high pressure water is intensified and delivered from a separate part of the apparatus called an "intensifier." In the most modern type, of which the new installation at the New Glasgow works of the Nova Scotia Steel & Coal Company is an example, this feature enables larger work and a greater range of work being performed with the same machine.

The new plant of the Nova Scotia Steel & Coal Company consists of two presses complete with all the necessary accessories such as accumulators, furnaces, etc., housed in a steel, brick, and concrete building 240 by 72 feet. Two electric cranes of 50 and 30 tons capacity serve the entire building. One press is rated at a capacity of 4,000 tons, and the other at 600 tons. The larger press is 128 by 64 inches between the supporting columns, has a total stroke of 80 inches, weighs 740,000 lbs., and is capable of handling forgings up to 75 tons in weight. As the presses are exactly alike except in size, a detailed description of one will suffice.

Each installation consists of the press proper, the pre-filling water tank and the patent hydraulic intensifier. The press consists of a heavy base plate, embedded in the concrete foundations, on which stands the anvil, together with the four forged steel columns which support the press head. Situated near the top of the press are two return steam-cylinders, and the hydraulic or ram-cylinder which is located on the centre line of the press.

Immediately below the press-head is situated the press-traverse, the upper end of which is firmly attached to the piston rods of the three cylinders above referred to. Below the traverse is fastened the upper forging tool or tup. The traverse has four bushed guides, encircling and sliding on the supporting columns, to keep it in alignment and take up the heavy side strains when the ingot is not exactly under the tool centre.

The pre-filling water tank is an air chamber equipped with a pump for charging to a certain level at a pressure of 65 lbs. to the square inch. This tank supplies water to the ram and intensifier cylinders and again stores the water which leaves the ram-cylinder when the piston rises, the flow being automatically controlled by a water valve.

The intensifier, which produces the high hydraulic pressuer, consists of two cylinders, a large one, with steam actuated piston, placed immediately above a smaller one containing water. They have a common piston rod, the lower end of which, extending through and working in the water cylinder, acts as the plunger

of a force pump. When the steam cylinder piston moves upwards, the water is forced from an opening near the top of the lower or water-cylinder, at very high pressure, owing to the difference in their diameters, and enters the ram-cylinder giving a greatly increased pressure there. The intensification is 50 to 1, and gives a water pressure of 3½ tons per square inch in the ram-cylinder. All the valves controlling the various operations are at the side of the intensifier and are all operated by a single lever, so adjusted that the press follows its movements in speed and stroke.

The press may be operated in four separate ways and under each the tup may at moment be arrested instantly and a new stroke inaugurated by a single movement of the controlling lever. The tup may be actuated (1), by the steam cylinder alone, the press then operating like an ordinary single acting steam hammer; (2), with the intensifier giving high pressure only toward the end of the stroke. This is the method used in ordinary forge work; (3), with the high pressure throughout the entire stroke, used in pure press work, cutting, etc.; (4), with intensifier and under steam cylinders which results in rapidly repeated heavy blows delivered at a fixed height. This method is used for finishing work to exact size, the length of the stroke being automatically controlled.

When making heavy forgings, whether under the hammers or presses, the piece must be frequently moved and turned, especially when the finishing strokes are being given. To do this speedily and cheaply, a mechanical handling equipment has been installed, the forging being suspended and rotated by an endless chain driven by electric gear attached to the forging crane. This crane may be operated from the usual suspended cage and also from a pulpit at floor level, close to the presses. There are two hydraulic operated rests on each side of the big press for supporting long forgings. These travel twenty feet each way. Hydraulic manipulating gears are provided for adjusting the different bottom anvils. On the large press, the range of this appliance is about 12 feet.

The low pressure hydraulic installation operating this mechanism consists of a dead-load accumulator supplied by an electrically-driven three-throw vertical pump. The motor is 50 horse power, and the pump supplies 50 gallons per minute against a working pressure of 720 lbs. per square inch to the accumulator ram.

Rapid working, range of utility, economy, and every other requirement of modern forging practice are fulfilled by this plant. The steam consumption is extremely low as the cylinders do not have to be kept filled continuously.

From the viewpoint of the consumer, the product of the steam-hydraulic forging press has many advantages. This is not only because forgings may be produced at a lower cost, but the improvement in the quality of forgings is even more important.

NOTES ON THE MURRAY MINING LABORATORY, HALIFAX, N.S.

A general outline of the equipment and course of treatment is as follows:

Broken first in a 7x10 in. Blake breaker or an "O. D." Gates breaker, the ore, after sampling, runs by gravity to a pair of 10x12 in. laboratory rolls. From these rolls the ore is elevated by a 6 in. rubber belt elevator, and dumped into a set of three 16x24 in. trommel screens. These so size the ore that the coarse material may be sent back to the rolls for recrushing or to a 3½ ft. Huntington mill; the product from this mill returning to the elevator.

The medium size product of the screens goes to a laboratory size Hartz jig, which may make three products, concentrates, middlings, and tailings. Either of these last two products may return to the Huntington mill for regrinding.

The finer sized product of the screens may be sent to a laboratory size Richards pulsator jig, or may pass to a half size Wilfley table for treatment. If desired, the finest of the screened products may run to a hydraulic cone classifier, whose spigot product goes to a standard 4 ft. Frue vanner, the overflow to a James slime concentrator.

The above unit is arranged so that any of the separate machines may be run by itself when used to test ores in small quantities.

To the west of the concentrating unit comes the stamp mill unit. As will be seen by the flow sheet, the gold ore can be broken in either of the two coarse breakers, sampled, and fed by a Challenge feeder into a battery of five stamps, weighing 300 lbs. each. The crushed pulp issuing from the battery, flows over an amalgamation plate eight feet long. The Huntington mill mentioned above is set at an elevation sufficient to allow any gold ores which might be ground in it to flow over this same amalgamation plate. From here the pulp after passing an amalgamation trap, flows to a Frenier sand pump, and is elevated to a height sufficient to allow it to flow to the cone classifier mentioned in the concentration mill scheme: and from here to the same Wilfley, vanner or slime table.

In connection with this gold milling unit, a small cyanide plant of usual laboratory design has been installed. This plant is in an unoccupied space, 40 ft. by 25 ft., to the south of the concentration unit. Thus the laboratory has sufficient room for future growth without crowding the machines, as the only other occupant of this space at present is a small magnetic concentrator.

The space at the extreme west of the building, 24 by 52 feet, is devoted to apparatus unique in the history of college metallurgical laboratories. For the purpose of familiarizing the student with the ordinary steam and air mining machinery, a small steam air unit has been installed. It consists of a 30 h.p. upright steam boiler, connected to a 10x10x10 inch straight line air compressor. The air end of the compressor is in turn connected to an air receiver, and this air line gives power to various rock drills or coal cutting machines as the work necessitates. The steam and air lines are also connected to a small duplex reversible steam hoist. From the hoist a wire rope leads over a model headframe to a model mine cage.

If the innovation is successful in its purpose of teaching the student to familiarize himself with this common phase of mining work, an underground section will be added to the laboratory, where the principles of timbering and underground mining may be learned first hand.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

The very singular circumstances under which Neil tewart, a deputy-overman employed in the No. 3 colery of the Nova Scotia Steel & Coal Co., was lost in nine for over five days, have been given large publicity n the newspapers. The incident reads like a page from he "Wide World Magazine," and gives large scope or imaginative writing. Mr. Stewart's duties included he examination of old workings, and he was last seen n the forenoon of Monday, the 9th of September. He vas missing until discovered by a search party about oon on the following Saturday. In avoiding a fall of oof Mr. Stewart's lamp was accidentally extinguished, nd he was left in darkness in an air-course. After reeated attempts to find his way out Mr. Stewart crawld through a small opening in a cross-cut and entered vhat may be termed a cul-de-sac in No. 3 room on No. landing. In this small aperture Stewart remained rom Monday night until his discovery on Saturday norning. He kept his watch wound up, and relieved is thirst by moistening his lips with oil from his safety amp. Naturally the occurrence caused great excitenent among the Sydney Mines people and throughout he mining community of Cape Breton. The experience s one which no one will envy Mr. Stewart. It is not n unusual occurrence for men to lose temporarily their vay in old workings, but such a protracted solitude as hat experienced in the present instance is most rare ndeed.

An obvious safeguard against the recurrence of such happening is that every man whose duties include the xamination of unfrequented and abandoned workings hould be provided with an electric flashlight, or if langer from gas is apprehended, with some form of lectric hand lamp in addition to the ordinary safety amp.

The occurrence must have been a costly one for the Nova Scotia Steel & Coal Co., who lost a week's output nd presumably were put to large expense in searching or the missing examiner. It is satisfactory to know, however, that the persistent efforts of the search parties vere rewarded by the finding of the missing man beore it was too late.

DOMINION COAL OUTPUTS.—The September output of the Glace Bay collieries was approximately 380,-00 tons, comparing with 324,311 tons in September, 911. It goes without saying that this is the largest September output yet produced. August output was 11,000 tons, and the apparent falling-off is explained y the fact that September had only twenty-four workng days, whereas August had twenty-six. The rate of production therefore remained at the same high level as in August. The aggregate output for the nine months ending 30th September, amounts to 3,321,000 tons, comparing with 2,974,000 tons for the same period of last year, showing a gain of 347,000 tons. It is hoped that n October a further marked advance will be made, as n October, 1911, the production was hindered by various delays to shipping.

The Springhill collieries put out in September 31,707 ons, slightly exceeding the figures of last September. The total output for the nine months ending 30th September, is 312,700 tons, comparing with 158,894 tons for the same period of 1911, or an increase of 154,000 ons.

The combined increase from the mines at Glace Bay and Springhill is therefore slightly in excess of half a million tons when compared with the production during the corresponding period of last year.

The new coal washer which the Dominion Coal Company have constructed near the International piers at Sydney is completed with the exception of adjustments, and trial washings are being made.

A site is being prepared at the rear of the coke-oven plant of the Dominion Steel Company in Sydney for a new banking station for the Dominion Coal Company. The new mines at Lingan are nearer to Sydney than to Glace Bay, and as the banking station in Glace Bay will be fully taxed to deal with the coal from the Glace Bay collieries during the stocking season, it has been decided to stock coal in Sydney. The projected banking station in Sydney will necessitate considerable expenditure in railway tracks, sidings and trestles, and will include a modern re-screening plant. The site will be laid out to cover the future requirements of the new collieries, which will be considerable and will increase for some years to come.

ONTARIO.

COBALT, GOWGANDA, SOUTH LORRAIN

Low Grade Disappearing.—The gradual elimination of the low-grade car is proceeding apace. The Nipissing is actually at the present time the only mine shipping any quantity of less than 300 ounces to the ton, and after November all their silver will go out as bullion. The Butters process of reducing concentrates to bullion has led to another decrease in tonnage and the Buffalo ore after this year will all be shipped out as bullion. It is a by no means uncommon occurrence to have over $100,000 a week in bullion sent out, and one day this month that amount left on the Montreal train for the English market. For the first time for years a Cobalt mine has been paid for a by-product. Both the Drummond and the Temiskaming have received a small addition to their cheque from the copper in their ores, and there is a slightly better demand for cobalt, though smelters are paying nothing for it as a by-product yet.

Crown Reserve.—The Crown Reserve has run into another good shoot of ore quite unexpectedly on the Ross Extension vein at the 150-foot level. At the 200-foot the Ross Extension showed no ore of value, and the present discovery will add to the ore reserves. The vein is three inches wide of very high grade ore. At the 550-foot level the same vein picked up, at the 500-foot is exhibiting native silver again. At present the ore is patchy so that the discovery is more interesting than commercially important.

Bailey.—The Bailey has made a shipment from its new shoot of high grade ore. While this property has been carefully developed for the past two years it is only this summer that it has shown any of the earmarks of a mine. There have been patches of ore but nothing to justify the title of a mine. Now this vein has been followed for over 60 feet and it shows three or four inches of two to three thousand ounce ore. On the top of Diabase Mountain the Alexandria is starting up again in the hope of picking up the continuation of this rich lead.

King Edward Lease.—Work on the King Edward mine under the lease obtained by H. E. Jackman should soon be commenced by the New York Ontario Silver Mines Company, the syndicate of Syracuse men who will operate the lease. The Silver Queen, another derelict, has been taken over by an English syndicate, and Foster is being worked by the T. J. Flynn syndicate at the 70-foot level. The deal for the Cochrane has not yet been put through, but in all probability it will, and the Temiskaming will open it up. The Townsite is drifting into the Cobalt Townsite which it purchased, and the Buffalo is opening up the Nancy Helen. The Gould Consolidated has gone into liquidation, so that its lease on Peterson Lake will revert to the Peterson Lake Mining Company, which will no doubt continue its development, as when intelligently operated it appears to have a good chance of making good.

South Bay Specimens.—Mr. J. O. Adsit, of the South Bay Mines, is exhibiting some very choice samples from a strike on that Gowganda property. Not so lucky were the gentlemen, who came out with rich specimens from, it is said, the Bruce claims. They were robbed of their silver on a Michigan Central train and the report outlining the robbery stated that "the samples had been purchased in Cobalt." This must be an error which the gentlmen concerned should see is contradicted at once.

On September 30 the Temiskaming and Hudson Bay paid their 42nd dividend, and have now returned to their New Liskeard shareholders 21,400 per cent. on the original investment of a little less than $8,000. Seven thousand dollars odd has bred $1,660,854 in five years.

In the annual report of the Kerr Lake Mining Company Mr. Robert Livermore, the manager, states that of the estimated 6,660,091 ounces of ore reserves, 2,781,400 ounces is under the lake. This cannot be touched until Kerr Lake is drained. This project was discussed three years ago, but none of the mines desired to take upon themselves the expense of cutting the canal, and therefore it has been allowed to drop.

The Northern Ontario Light and Power Company has absorbed the British Canadian Power Company, and is now the sole purveyor of electric power in the north country. The parent company was the Cobalt Hydraulic, then the Cobalt power was taken over and the franchises of the New Liskeard and Haileybury secured. A consolidation was effected with the Cobalt Light, Heat & Power Company, and the company assumed its present name. This year the company has taken over the Waiwaiten Falls power project, and more recently the Porcupine Power Company. The absorption of the British Canadian completes the long list of mergers.

PORCUPINE AND SWASTIKA

Hollinger.—Reports that Hollinger will pay a dividend on or before the New Year and the excellent results obtained at the same property and the Dome mills discoveries on the Jupiter and Pearl Lake and the steady development of the Plenaurum, the McIntyre, the Vipond, the Dome Lake, the McEaneny, and the Porcupine Lake have placed mining upon a sound basis in Ontario's gold camp.

It is currently reported in the camp that the Hollinger will pay shareholders a dollar a share as a Christmas or New Year's gift and though this is as yet without the official cachet, it is certain that they will have the money if they wish to go on a dividend basis at once. Such an action would stimulate interest in the camp very materially. Mill troubles are now almost past history, everything is to be used except the pan amalgamators, and as it is running to-day the process is saving 98 per cent. of the gold at a cost of, it is reported, only $1.50 a ton. With the thirty stamps falling 300 tons from the dump and the first level are being run through every day. A minor irritant is the refining of the gold. The Hollinger has no refinery as yet, though one is to be built and the bullion was returned from the Ottawa mint and afterwards from New York, with a note to the effect that they could not handle it direct until it had been purified. It is now being shipped to one of the American smelting companies across the line, who of course, make a charge for treatment.

Before the annual report is issued it will be possible to point to development at the third level as a direct confirmation of the promises made in the report of last year. The main vein has been cut and is fully as wide and as rich as on the other levels as far as it has been drifted upon. A new motor driven compressor has just been installed and it will almost double the amount of power available for development.

The Dome.—At the Dome where the capacity of the mine has always been well ahead of the mill another tube mill and slime press are to be installed so that 450 tons per day can be treated. It has been found that when a coarse screen is used the plates under the stamps scour badly and these are to be abandoned and the ore will be crushed in solution. The inclined tramway from the rock house to the ore shoots has been continued down to the 100 foot level. Most of the ore is still being dropped down from the surface to the 60-foot level, but some is coming from development at the hundred. The management of the Dome has always relied upon the results of the diamond drill campaign, and so far they have proved quite trustworthy. The values in the drift have invariably been higher than the assays obtained from the diamond drill core.

Pearl Lake Drilling.—Those who have and who are opening up properties and erecting plants on the strength of diamond drill results will be gratified with the discovery of ore on the Pearl Lake mine. Mr. Thompson found ore for the company at 400 feet running about $8 to the ton; the drift shows about six feet of $12 ore. In the same campaign Mr. Thompson struck another ore body of 800 feet, and if results at 400 feet were reliable it is most probable that they will not fail at 800 feet. The Porcupine Lake Mining Company is like the Dome, basing the whole scheme of development upon the good results obtained in their diamond drill cores during their exploration work under and near the lake last winter and this spring. Camps are being rushed up and a power plant to drive a big compressor has been ordered. Before the winter underground work should be in full swing. Diamond drilling to locate ore bodies has, also, been quite successful at the Dome Lake. So far where the core showed gold there gold was found in the drift. As a general rule the average of gold content found in the core was much lower than actually recorded in the drift.

Stamp Mills Multiply.—Four mills are at present running in the camp, and three are under construction. These latter are the McEaneny, the Dome Lake and the McIntyre. The McEaneny is the farthest advanced, for here the foundations are almost completed. The McIntyre is well advanced with its concrete work and the Dome Lake has almost finished excavations. The McEaneny should have five stamps of their ten dropping by the end of November, the McIntyre by

the first of January, and the Dome Lake perhaps a little earlier. Altogether before the snow leaves the ground next year there ought to be more than a thousand tons of ore crushed every day in the year.

Jupiter Plans.—The conservative policy of Drummond development slowed down the progress of the Jupiter this summer when one series of veins did not prove up well at the 300-foot level. The other series in the southern portion of the property is now showing such excellent ore that there is no longer any doubt of the fact that the Jupiter is a mine. This winter will be set aside for development and exploration, if everything continues as satisfactorily as at present it is pretty certain that a mill will be built next spring.

McEaneny.—The development of the McEaneny has surpassed all expectations. The third level as it appears to-day shows the widest exposure of quartz and the best values in the mine. The mine has to-day three-quarters of a mill in sight, $90,000 of which is in the dump. It is estimated that for about a thousand feet in drift and raise the vein averages three feet and a half of $28 ore. On the 300-foot level 250 feet have been developed 42 inches wide of better than two-ounce ore. On the 200-foot 450 feet of about an ounce and a half, and on the 100-foot, 200 feet of ore. A raise being put through to the surface is still in good ore so that it is probable that it will be possible to reckon reserves from the grass roots down. It is estimated that the five stamps can be fed from development work and the proceeds will pay running expenses at least.

BRITISH COLUMBIA.

Two of the metalliferous mining companies operating in British Columbia have lately declared dividends, namely, the British Columbia Copper Company and the Standard Silver-Lead Company. That of the former was of 2½ cents a share on its $2,000,000 shares, total $50,000, and the latter 15 cents a share on its 591,709 issued shares, total, $88,756.35. The Standard Company's dividend is its regular monthly distribution, while the British Columbia company's is a quarterly dividend, the second during the current half year.

The Coronation Mines, Limited.

A Victoria correspondent of Mining and Scientific Press, San Francisco, has sent to that journal the following information:

"The Coronation Mines, Ltd., of Cadwallader Creek, Lillooet, is doing a fair amount of development, and twelve miners are at work. The cross-cut on the 400-foot level at the Little Joe claim cut the lode, which is from 18 to 24 inches wide, and the shoot has a length of 35 feet. A rise is being made to No. 3 level, and gold is visible up the rise and along No. 3 drift. At the Countless claim, some 1,200 feet away from the former, a lode which outcropped on the surface 700 feet west was cut 415 feet from the portal of the cross-cut. This is 190 feet from the surface, and shows free gold and pyrite over a width of 4 to 5 feet. Driving is under way for the Little Joe vein, which has been opened on the surface for more than 600 feet, the ore assaying $18 per ton throughout."

Enquiry Under the "Coal Mines Regulation Act."

Recently an enquiry was held at Merritt, Nicola Valley, by Mr. John Stewart, of Ladysmith, Vancouver Island, who was appointed under the "Coal Mines Regulation Act," at the instance of the Hon. the Minister of Mines for British Columbia, concerning the conduct of Mr. Benjamin Browitt as manager of the Diamond Vale Colliery at Merritt, and holder of a first-class certificate of competency.

The notice of the intention to hold the enquiry, sent to Mr. Browitt by the Minister of Mines, was as follows:

"The enquiry in this case will be into representations that have been made: That you, as manager of the Diamond Vale Colliery at Merritt, B.C., did, in violation of the 'Coal Mines Regulation Act,' (1) Unlawfully employ as a fire boss in the No. 3 mine of the said colliery, on the 7th day of March, 1912, and divers days previously, one Henry J. Grimes, who was not the holder of a Certificate of Competency to act as a fire boss. (2) That you, being the only holder of a Certificate of Competency to act as fire boss in said mine, did delegate your powers as such to the said Henry J. Grimes, who was not the holder of a certificate, as aforesaid. (3) That by reason of your negligence the said mine was not examined as required by the 'Coal Mines Regulation Act,' before the men were admitted thereto. (4) That on the 7th day of March, 1912, an explosion occurred in the said mine whereby seven men lost their lives. (5) That you have been convicted of an offence against the said 'Coal Mines Regulation Act,' and (6) that by reason of the foregoing you are unfit to be the holder of a Certificate of Competency under the said 'Coal Mines Regulation Act.'"

Prior to the sending to Mr. Browitt of the notice of intention to hold an enquiry, he had been prosecuted and fined for the offence against the Act, as above narrated. The Commissioner who held the enquiry decided that the representations made to the Minister of Mines were proved by the evidence taken by him to be fully sustained, so he cancelled Mr. Browitts Certificate of Competency.

On the same day he heard a charge against Andrew Pilkenen for making up dummy tamping cartridges, these having clay at each end and coal dust in the middle, in violation of the Act, with the object of deceiving the shot-lighter. The Act provides that clay only shall be used, so the defendant's certificate of competency as a miner was suspended, the charge made against him having been proved.

The Portland Canal Tunnels, Limited.

Late in September Mr. W. J. Elmendorf, who during the whole period of the erection equipment, and operation of the Portland Canal Mining Company's concentrating plant was in charge of the company's mining and concentrating operations, returned to the Portland Canal district to commence the work of driving a 2,000 foot cross-cut tunnel, which enterprise has been taken by a newly organized company, named the Portland Canal Tunnels, Limited. This company was incorporated in August with an authorized capital of $700,000, divided into 2,800,000 shares at 25 cents each. The following is an excerpt from a published statement relative to the purposes for which this company has been organized:

"The Portland Canal Tunnels, Limited, has been incorporated for the purpose of driving a tunnel, about 2,000 feet in length, to tap the main fissure zone upon which are located some of the most important mineral properties in Portland Canal camp. The tunnel will be of a sufficient size and capacity to amply fulfil the objects of its construction, which may be briefly summarized as being the accommodation of all probable future traffic, and the providing of drainage, ventilation, and

the most economical means of development for all properties in the main fissure zone.

"Some indication of the wide scope of the company's proposed operations may be gathered from the list of mining properties, situated along the main fissure zone above referred to, which will be affected by the construction of the tunnel. They are as follows, reading from south to north: Ben Bolt, Jumbo, Chicago No. 1, Chicago No. 2, the Portland Canal property (a group of about 16 claims), O. K. fraction (two claims), Portland Wonder, Glacier Creek (six claims), Stewart Mining and Development Company (ten claims). In addition to these company claims there are a number of individual claims, practically all on both sides of Glacier Creek.

"It will be seen that the Portland Canal Tunnels, Limited, will serve a very extensive mineralized area, in which are situated a large proportion of the most prominent mining properties in the camp, the construction of the tunnel placing them in direct connection with railway shipping facilities to tidewater."

Information quoted from a report by Mr. Elmendorf makes it appear that conditions are favourable to success in developing much ore. He mentions that 15,000 tons of ore has been taken out of the small stopes of the Portland Canal Mining Company's property, which would have shown more profit had this tunnel been available.

Consolidated Mining and Smelting Co.'s Exhibit.

The Consolidated Mining and Smelting Company, of Canada, Limited, made an exhibit at the Trail exhibition, concerning which the Rossland Miner said:

"It was a complete exhibit. In it was shown raw ore from every mine owned by the company; then the forms which the ore passed through in the process of extraction by the fire process; crushed silver-lead and gold-copper ores; also briquettes, matte, and bullion. In miniature the method of refining the bullion was displayed in the shape of anodes and cathodes from the refinery; then there was the refined gold, silver and lead, also copper and bluestone (sulphate of copper). There was a gold brick—not the kind sold to 'come-ons' in New York, but of almost pure gold, valued at $14,000—and a bar of silver weighing 1,264 oz. The pig lead was of the finest quality, containing only a fraction of one per cent. in impurities. And there was lead pipe, ranging in size from half an inch to four inches in diameter, of any weight required.

"Large photographs of the Trail smeltery, the Centre Star and War Eagle mines at Rossland, the Snowshoe mine at Phoenix, and the St. Eugene mine at Moyie, also formed part of the exhibit, which was in the charge of Richard Truswell, foreman of the company's refinery at Trail, and John F. Miller, superintendent of the refinery."

Consolidated M. and S. Co.'s Operations.

Following the foregoing notice of the Consolidated Mining and Smelting Company's exhibit of its products, the time is opportune to give some information concerning the company's operations during its last fiscal year, which ended June 30, 1912. It may be, though, that the figures that fololw will not agree in full detail with those that will shortly be available when the company's printed report shall have been issued, for these were obtained before the report was prepared.

Le Roi.—During the latter part of the fiscal year about 4,000 tons of ore was shipped monthly from this mine; its aggregate output for the year was 39,345 tons. A number of small bodies of high-grade ore were worked. Not much work was done on the lower levels. the chief operations having been on several levels down to the 600-foot. Only one stope each on levels 8 and 9 was worked. The lower levels will have attention later; meanwhile prospecting is done as operations are carried along. It is satisfactory to note that there has been a gradual improvement in the general average grade in the ore mined.

Concentration Experiments.—A small plant has been put in on Le Roi ground for the purpose of making concentration experiments with some of the more silicious ore from this mine. Encouraging laboratory results have been obtained. so one unit of the Elmore Vacuum Process plant has been put in, together with some plant from the ore testing works at the St. Eugene mine. The capacity of the experimental plant is about 40 tons a day.

War Eagle.—On the thirteenth level of this mine, at a depth of about 2,000 feet from the surface, two shoots of ore have been worked, these giving ore containing comparatively high value in gold. Their joint length is about 450 feet, and they occur on the present lowest level of this mine. A cross-cut is being driven from the Centre Star twelfth level to open the War Eagle at 150 feet deeper than its thirteenth level. This cross-cut will be about 1,000 feet long; when the mine was visited two months ago, the cross-cut had been driven about 250 feet. As progress had been at the rate of 170 to 180 feet a month, it is probable this drive is now in more than 600 feet.

Other Rossland Properties.—During the year the company took over the Virginia and Iron Horse properties, which lie north of its Idaho and Enterprise mines, and east of the Iron Mask.

St. Eugene, East Kootenay.—Production has fallen off very seriously at this mine. For six months ended December 31, 1911, only 13,374 tons of ore was mined and milled, and from this there was produced 1,957 tons of lead-silver concentrates averaging 56 per cent. lead and 26.5 oz. silver per ton. This compares proportionately with 47,705 tons mined in the year ended June 30, 1911, from which was obtained 7,708 tons of concentrate containing an average of 59.4 per cent. lead and 26.5 oz. silver per ton. Figures of production, if any, during the first half of the current calendar year were not obtained. At the time above mentioned as that at which information was applied for, some 20 to 25 men had been put on to do further prospecting in the St. Eugene mine, after operations had been suspended for a while.

The ore-testing plant at the St. Eugene concentrating works was not much used during the fiscal year under notice.

Sullivan.—Additions to plant, equipment, buildings, etc., were completed, these including ore-crushing and sorting plants, and a compressor driven by water power Besides maintaining shipments of lead ore, there was also sent to Trail 898 tons of iron sulphide.

Molly Gibson. A cross-cut tunnel was driven about 800 feet to allow of ore being mined to a greater depth of 250 feet. The concentrating plant was put in order for the purpose of concentrating the lower grade ore Both crude ore and concentrate are the shipping products from this mine, which is situated north of the west arm of Kootenay Lake and about 20 miles from Nelson.

Richmond Eureka.—Production was small at this Slocan mine during the last fiscal year, only 1,628 tons

compared with 3,168 tons for the fiscal year ended June 30, 1911.

Other Properties.—Nothing was done on the No. 7 mine in Boundary district. The option of some claims in Sheep Creek district, Nelson mining division, was relinquished, results of development work done not warranting purchase of the property by the company. In Ainsworth camp, sorting and shipping ore was in progress at No. 1 mine, some work was done on the Tiger, and the Highland was also prospected. The aerial tramway that had been on the Le Roi, Rossland, was sent to Ainsworth, for erection between the No. 1 mine and the Highland shipping wharf on Kootenay Lake, to facilitate shipment of No. 1 ore.

Trail Smelting Works.—Changes were made in the method of handling low-grade matte. The old method was to crush and granulate the low-grade matte, roast it in O'Hara's roasting furnaces, cinter in Heberlein pots, and re-smelt with 15 per cent. of coke. The present process is simply to crush and re-smelt with 3 per cent. coke and 46 to 50 per cent. silicious ores. This is a regular pyritic process.

The Dwight-Lloyd cintering plant is not being used for lead-zinc ores; only for copper-gold concentrate. The Huntington-Heberlein plant here gives better results from treatment of zincky ores. This plant is to be rearranged during the autumn, and a 20-ton electric crane will be put in for handling the Heberlein converting pots. A new crusher, Farrel, 36 by 24, is to be added to the plant.

COMPANY NOTES

HILLCREST DIVIDEND.

Notice has been given that a dividend of 1¾ per cent. has been declared on the preference capital stock of this company, payable October 15th, 1912, to shareholders of record September 30th, 1912. This is the ninth quarterly dividend.

GRANBY ANNUAL.

At the annual meeting of Granby Consolidated, held in New York October 1st, a surplus of $2,516,121 was shown. The company's production of copper, silver and gold for the year amounted to $2,874,759, although the lack of coke necessitated the closing of the Phoenix and Grand Forks mines and smelter for four months.

The development work at Hidden Creek progressed satisfactorily during the year, upwards of $200,000 having been spent on work preliminary to the building of a smelter. This property now stands on the company's books at $979,461.

The following officers were elected for the year: W. H. Nichols, president; Jay P. Graves, vice-president and general manager; W. H. Robinson, vice-president; Edwin Thorne, vice-president; Geo. W. Wooster, treasurer.

The board was reduced from 15 to 13, Messrs. George M. Luther and A. L. White retiring.

STATISTICS AND RETURNS

DOMINION COAL OUTPUT.

The Dominion Coal Company output for September was approximately 380,000 tons, somewhat below the August figures, but the best September the company has had in its history. At the present rate of output the figures at the end of the year will total 4,500,000 tons.

NOVA SCOTIA STEEL AND COAL OUTPUTS.

The output of the Nova Scotia Steel & Coal Company for September is as follows:—Coal mined, 67,889 tons; coal shipped, 87,789 tons; pig iron made, 7,490 tons; steel ingots made, 6,722 tons; iron ore mined, 57,913 tons; shipments of iron ore, 61,800 tons.

COBALT ORE SHIPMENTS.

The shipments from the Cobalt camp for the week ending October 4 were:—

	Tons.
La Rose, 2h	76.85
Buffalo, 2h	61.82
Crown Reserve, 1h	17.56
Coniagas, 5h	158.54
Bailey Cobalt, 1h	21.57
Cobalt Townsite, 1h	29.00
O'Brien, 1h	43.23
Beaver Con., 1h	24.26
Timiskaming, 2h	66.56
	499.39

BULLION SHIPMENTS.

	Ounces.	Value.
Nipissing	126,426	$81,429
O'Brien	16,938	10,671
Crown Reserve	16,000	10,000
	159,400	$102,100

BRITISH COLUMBIA ORE SHIPMENTS

Shipments in detail for week ended September 28:—

Boundary.

	Week.	Year.
United Copper	52	1,041
Nickle Plate, milled	1,500	56,600
Granby	30,363	936,145
Mother Lode	7,380	280,646
Rawhide	8,102	177,759
Napoleon	240	7,418
Unnamed	148	9,516
Other mines	....	20,012
Total	47,785	1,489,137

Rossland.

Centre Star	3,179	118,321
Le Roi No. 2	309	19,112
Le Roi	781	33,654
Inland Empire	22	22
Le Roi No. 2, milled	300	6,500

Inland Empire, milled	90	1,170
Other mines	....	237
Total	4,681	179,016

Nelson.

Queen	68	523
Second Relief	20	20
Hudson Bay	84	460
Granite-Poorman, milled	250	10,600
Mother Lode, milled	350	6,100
Queen, milled	300	9,600
Molly Gibson, milled	300	5,400
Other mines	....	5,106
Total	1,372	37,809

Slocan and Ainsworth.

Standard	306	6,673
Richmond-Eureka	65	1,074
Ruth	34	475
Van-Roi	31	1,852
Whitewater	22	595
Silver Hoard	25	60
Bluebell	63	1,194
Standard, milled	400	13,200
Van-Roi, milled	1,100	43,700
Bluebell, milled	200	2,100
Other mines	....	9,013
Total	2,246	79,936

East Kootenay.

Sullivan	510	22,968
St. Eugene	100	314
Monarch	72	1,071
Monarch, milled	425	7,725
Other mines	....	235
Total	1,107	32,313

Consolidated Co.'s Receipts.

Trail, B. C.

Centre Star	3,179	118,321
Le Roi No. 2	309	19,112
Le Roi	781	33,654
Inland Empire	22	22
Queen	68	523
Second Relief	20	20
Hudson Bay	84	460
Standard	306	6,673
Richmond-Eureka	65	1,074
Ruth	34	475
Van-Roi	31	1,852
Whitewater	22	593
Silver Hoard	25	60
Bluebell	63	1,194
Sullivan	510	22,968
St. Eugene	100	314
Monarch	72	1,071
United Copper	52	1,041
Other mines	....	20,605
Total	5,743	230,034

Granby Smelter Receipts.

Grand Forks, B. C.

Granby	30,363	936,145

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	7,380	280,646
Rawhide	8,102	177,759
Napoleon	240	7,418
Unnamed	148	9,516
Other mines	....	17,003
Total	15,870	492,342

TORONTO MARKETS.

Oct. 10 (Quotations from Canada Metal Co., Toronto)—
- Spelter, 6.50 cents per lb.
- Lead, 6.15 cents per lb.
- Antimony, 10 cents per lb.
- Tin, 51 cents per lb.
- Copper, casting, 18½ cents per lb.
- Electrolytic, 18½ cents per lb.
- Ingot Brass, 11 to 15 cents per lb.

Oct. 10—Pig Iron. (Quotations from Drummond, McCall & Co., Toronto)—
- Summerlee No. 2—$23.50 (f.o.b. Toronto).
- Midland No. 1—$22.00 (f.o.b. Toronto).
- Midland No. 2—$21.50 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¾-inch lump.

Coke.

Oct. 7.—Connellsville Coke (f.o.b. ovens).
- Furnace coke, prompt, $3.00 to $3.25 per ton.
- Foundry coke, prompt, $3.40 to $3.50 per ton.

Oct. 7.—Tin, Straits, 50.15 cents.
- Copper, Prime Lake, 17.70 to 17.80 cents.
- Electrolytic, Copper, 17.70 to 17.75 cents.
- Copper Wire, 19.00 cents.
- Lead, 5.10 to 5.12½ cents.
- Spelter, 7.55 to 7.65 cents.
- Sheet zinc (f.o.b. smelter), 9.00 cents.
- Antimony, Cookson's 10.12½ cents.
- Aluminium, 26.00 to 26.50 cents.
- Nickel, 45.00 cents.
- Platinum, ordinary, $45.50 per ounce.
- Platinum, hard, $48.00 per ounce.
- Bismuth, $2.00 to $2.25 per lb.
- Quicksilver, $42.00 per 75-lb. flask.

SILVER PRICES.

	New York. Cents	London. Pence
September 21	63⅜	29¼
September 23	63⅝	29⅜
September 24	63⅝	$29\frac{5}{16}$
September 25	63⅝	29⅜
September 26	63⅝	29¼
September 27	63⅝	29⅜
September 28	63¾	$29\frac{7}{16}$
September 30	63¾	$29\frac{7}{16}$
October 1	63⅞	29½
October 2	64⅛	29⅝
October 3	63⅞	29½
October 4	64	$29\frac{9}{16}$
October 5	64⅛	29⅝
October 7	64	$29\frac{9}{16}$

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

Dominion of Canada.

Ontario

Astley, J. W.
Bewick, Moreing & Co.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Hore, R. E.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Miles, A. D.
Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
Spenc r, W. H.
Sutcliffe, & Neelands
Tyrrell, J. B.
Willmott, A. B.

Quebec

Cohen, S. W.
DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Obalski & Dulieux
Ross, J. G.
Woolsey, W. J.

British Columbia

Ashworth, James
Fowler, S. S.

FOREIGN-New York

Hassan, A. A.
Hore, R. E. Houghton, Mich.
Constant, C. L. & Co.

ASSAYERS, CHEMISTS AND ORE TESTERS.

Dominion of Canada

Ontario

Brown, A. H.
Campbell & Deyell
Heys, Thos. & Son.
John, D.
Canadian Laboratories, Ltd.
McNeill, W. K., Manager

Quebec

Hersey, Milton Co., Ltd
Obalski & Dulieux
Dr. J. T. Donald

British Columbia

Bryant C. M. & Co.

Foreign-New York

Ledoux & Co.
Carey, E. E., Cal.

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General Manager,
Crown Reserve Mining Co. Ltd.
Cobalt, Can.

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Ontario Land Surveyors Etc.
Sudbury, Ont.
Branch Office: Sturgeon Falls, Ont.

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Mining Engineer,
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BELLEVILLE, ONTARIO.

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Mining & Metallurgical Engineer
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Metallurgical Engineer for Merrill Metallurgical Co.

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NELSON, B. C.

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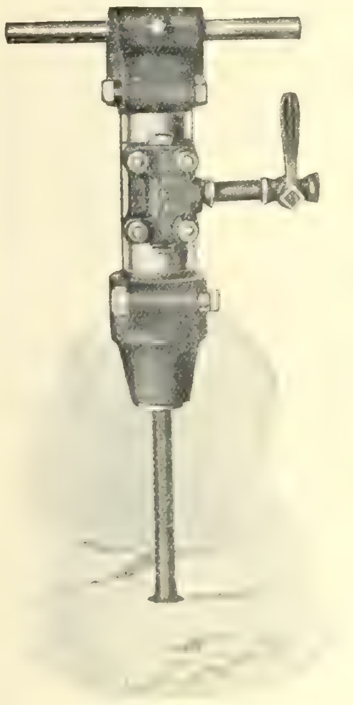

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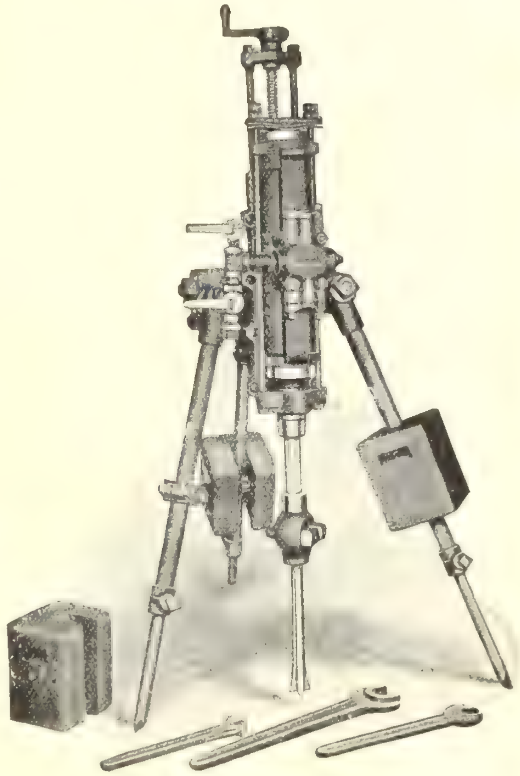

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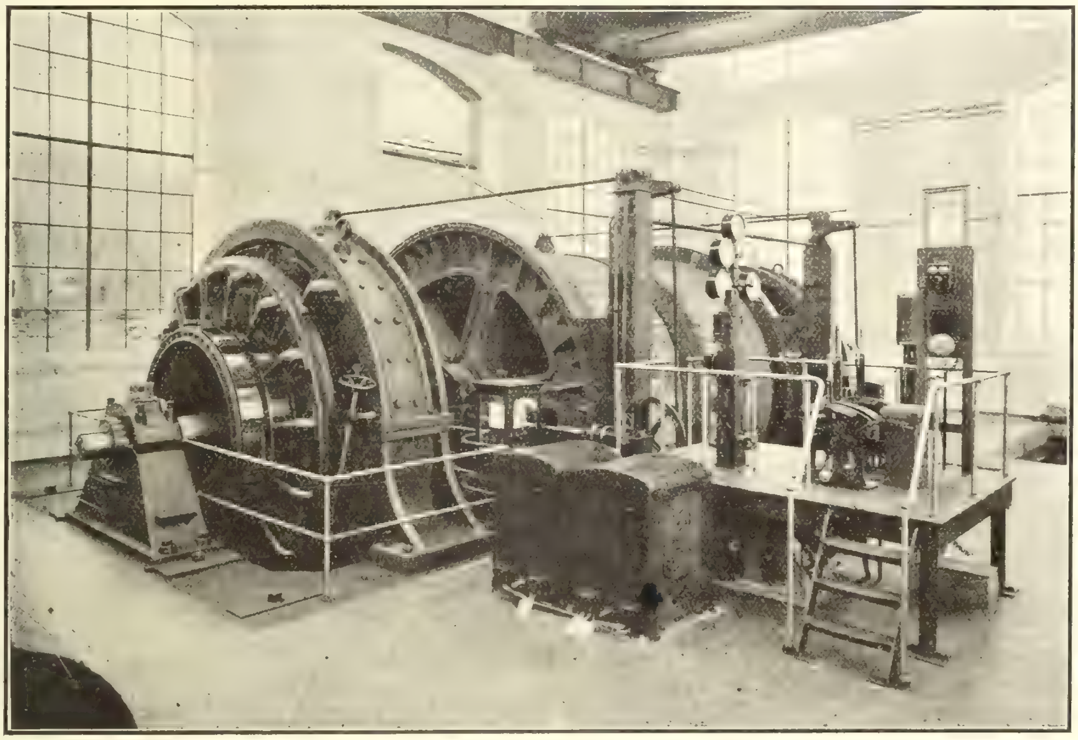

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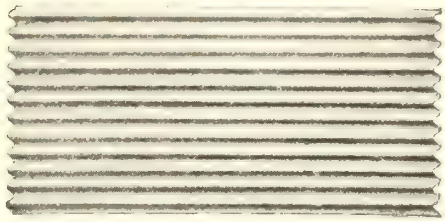

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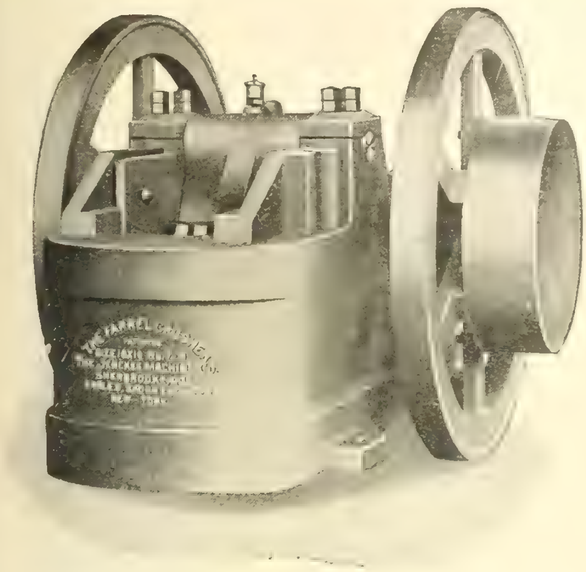

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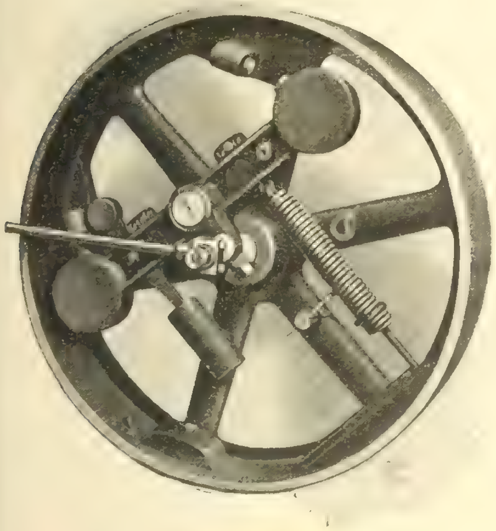

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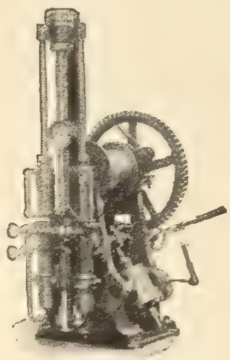

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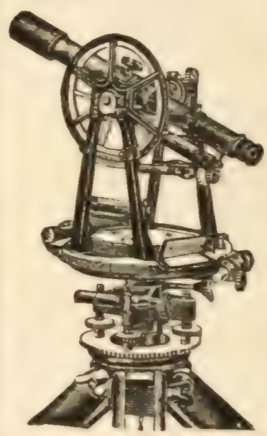

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, November 1, 1912. No. 21

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879.'

CONTENTS.

CO-OPERATION IN MINING.

In a thoughtful and frank paper, reprinted in this number of the Canadian Mining Journal, Mr. W. H. Prest analyzes the present condition of gold mining in Nova Scotia, and suggests as a tonic certain forms of co-operation.

"For two generations," says Mr. Prest, "the gold miners of Nova Scotia have struggled, each one for himself. . . . . without organization, without sufficient funds, and without that patriotic feeling for the industry we represent, which, once expressed in energy would place gold mining in Nova Scotia in a respected footing. . . . . And while we watch our province gold yield is dropping year by year and we are unable to stop it."

Mr. Prest then traces, picturesquely enough, the unrealized dreams that have been indulged in by "editors, politicians and mining men," and evolves the following diagnosis. The causes of the decline, he states, are:

First, not want of capital, but lack of confidence.

Second, want of knowledge and skill in the workmen.

Third, want of funds by the actual owners.

Fourth, want of co-operation between the capitalists and the prospector.

Instances are not lacking all over Nova Scotia of work badly done, of locations foolishly chosen, and of the stoppage of prospecting in the verge of success. As for the larger incorporations, these have uniformly suffered from the fact that while controlled from inside, their financial support had to be sought from outside.

All this being so, Mr. Prest urges co-operative efforts in certain directions and within certain limits. Emphasis is laid first upon the open valuation of mining property as a preliminary to capitalization. "Mere extent of territory counts for little," Mr. Prest wisely asserts, "where the principal criteria in selection are the quantity and the importance of rich 'float.' " The chief points to be considered, therefore, in placing a value upon a Nova Scotian gold property, are as follows:

First, the determination of the quantity of gould-bearing boulders, and the preparation of a plan shewing the distribution of these and of all gold-bearing quartz found. Panning results should also be mapped.

Second, the maximum value and the quantity of rich "float" should be estimated as closely as circumstances will permit. This can be done but roughly; nevertheless, it is thought by Mr. Prest to be of great importance.

Third, the position, character, and size of the drift boulders indicate the character of the vein. Giving due

weight to post-glacial changes, much can be learned of the vein itself.

Points Four and Five deal with the same indications of value.

Sixth, the presence of heavy overburden is not necessarily a deterrent. Only when prospecting is carried on without system will the depth of cover be a serious factor.

Seventh, the possibility of drainage should be well considered.

Eighth, the possession of water-power is often of vital consequence.

Ninth, the saving implied by the use of water-power should be measured in terms of steam-power.

Tenth, the accessibility of the mine is sometimes in Nova Scotia a serious item, and the possible need of building roads will, naturally, affect its value.

Mr. Prest then further suggests that all employees should become shareholders in the mine where they work. Gold-mining is not competitive; but knowledge and co-operation are much needed in the small mines of Nova Scotia. Intimate knowledge, for instance, of post-glacial geology is a *sine qua non* for the prospector. And the workman, who often farms, lumbers, and fishes in addition to doing a little mining, requires a direct inducement to keep him at work.

Mr. Prest's suggestions amount broadly to this,—let the operators pool their knowledge of the country and of the industry, give the miner a tangible and fixed interest in the mine, and the spirit of co-operation will at least have been generated. To an extent it will be possible to control valuation and capitalization. The mining fraternity, working as a unit, can accomplish these things and many more.

GEOLOGICAL SURVEY SUMMARY REPORT.

The summary report of the Geological Survey Branch of the Department of Mines, for 1911, is the most comprehensive yet published. Although, for sufficient reasons, it makes its appearance very late in the year, the character of the report itself compensates in a measure for this delay.

The Survey staff now includes 40 technical officers, 13 draughtsmen, and the necessary complement of stenographers. There are also an official photographer, a librarian, taxidermist, a collector, and several special clerks, etc. The total grant for the year ending March 31st, 1911, was $381,889, of which an unexpended balance of $120,594.81 remained unexpended at that date, and lapsed. The seeming anomaly was, no doubt, due to the fact that the arbitrarily fixed fiscal year does not correspond with the calendar year.

The field work during 1911 was conducted by 30 geological parties, and six topographical parties. The expenditure in each Province is given herewith:

Explorations in British Columbia	$26,352.37
Topographical surveys in British Columbia	39,766.30
Explorations and surveys in Ontario	10,770.60
Explorations in Quebec	4,904.39
Explorations and surveys in New Brunswick	6,203.45
Explorations in Nova Scotia	4,549.49
Explorations in North-West Territories	8,710.84

It will be noticed that British Columbia gets nearly two-thirds of the whole sum expended in field-work. While allowance must be made for the fact that long distances must be covered and heavy expenses incurred in geological investigation or topographical surveying in British Columbia, yet the disparity between the expenditures in the west and in the east is too marked. Quebec, New Brunswick, and Nova Scotia are more in need of attention than ever before.

In his introductory remarks the Director refers feelingly to the deaths of Dr. R. W. Ells and Mr. R. L. Broadbent. The former had been in active service for no less than 39 years. The latter was largely responsible for the excellent mineralogical exhibits now housed in the Victoria Museum.

Reference also is made to the resignation of Mr. J. A. Dresser, who accepted a very responsible position with a mining corporation. The Director lays stress in mentioning this resignation upon the urgent need of higher salaries and more rapid promotion. He points out that the loss of such an experienced officer is irreparable. However, as the Survey continues to be absolutely removed from political and other undesirable influences, and as it has a considerable body of well-trained young geologists and topographers to draw upon, its general position is healthy.

One important event during the year was the acceptance by Dr. Charles D. Walcott, secretary of the Smithsonian Institution, of the honorary position of Collaborator in Geology. This insures co-operation whenever necessary between workers on both sides of the boundary.

. . . . . .

In the report before us several important papers are presented in fuller detail than has hitherto been usual. Quartz mining in Klondike district, mining in Portland Canal district, the geology of Nelson map-area, the progress of clay investigations, placer gold in Quebec, the gypsum of New Brunswick ,the gold-bearing series of the Midway Basin, N.S., are among the subjects treated at length .

The Summary Report for 1911 may fairly be described as a comprehensive and satisfactory publication.

NICOL HALL.

The formal opening of the Kingston School of Mining's new Mining and Metallurgical Building took place on October 16th. A description of the building will be found elsewhere in this issue. We wish here to congratulate the School upon this much-needed addition to its equipment. We desire also to place on record our appreciation of Professor William Nicol's devotion and generosity. Without Professor Nicol's munificent financial aid, or, in fact, without his unceasing labours in every direction, the erection of the new structure

would have been delayed for years. The School of Mining would not then have been able to perform the functions that it is supposed to perform.

Most appropriately is the new building named Nicol Hall. It will be an enduring reminder of one man's loyal service to the institution.

But Professor Nicol himself would be the last man to desire that his services should shut from view the equally consistent labours of his associates. The director and all the professors have never spared themselves in working for the School of Mining.

A NEW TIN PROCESS.

An Australian, Mr. Arthur Richards, who is manager of the Cornwall Tailings Company, is experimenting successfully with a process whereby almost 100 per cent. of the tin in old tailing dumps or in fresh ore can be extracted at a low cost. At present, the usual practice permits of a recovery of not more than 60 to 75 per cent. of the tin. Hence, Mr. Richard's process will mean much to Cornish operators.

Mr. Richards mixes the crude ore, or the residues, with small proportions of cheap coal, salt, and a chemical unspecified. The tin is volatilized as tin chloride and collected in a chamber. It is claimed that practically none of it is lost.

As heretofore it has been possible to extract not more than from 30 to 50 per cent. of the tin left in old tailings, it will be seen the process will be of utmost importance from this point of view also.

THE C. M. I. WESTERN MEETING.

The Canadian Mining Institute recently held its first general semi-annual meeting in the West. The experiment was entirely successful and in future the western meeting will be a regular event. As is the case in the United States, the mining interests in Canada are very diverse; they are also spread over an enormous area. The problem of distances alone in a formidable one, in its relation to the general efficiency of the Institute. It has been solved to some extent by the organization of branches. But for the establishment of the Western Branch some few years ago it would have been difficult to have retained the interest and co-operation of western members in the work of the society. The present provision for a general meeting annually in the West will further stimulate interest, while having the important effect of strengthening the bonds of union between the eastern and western membership. It will, moreover, enable western members to participate more directly in the administration of the Institute's affairs, since they will now be afforded the opportunity of expressing their views as a body on any question of general policy. One outcome of the Institute's meeting at Frank was the organization of a strong branch for Southern Alberta. Another branch will, it is hoped, be established shortly in the north. These branches should serve a most useful purpose, not only in bringing coal operators in closer touch with one another, but in voicing the views of the mining men of the Province concerning legislation, intimately affecting their interests, which it is the intention of the Provincial Government to introduce in the near future.

EDITORIAL NOTES.

We hardly take to the idea of having the La Rose cash surplus, which amounted to about $1,500,000, handled by the Canadian Mining and Exploration Company. The latter company has ample money of its own to invest. It seems to us far better for La Rose to take care of itself.

The discovery of a rich vein of niccolite and smaltite, carrying from 4,000 to 5,000 ounces per ton, under Cart Lake, Cobalt, is one of the most significant occurrences. It will have the effect of placing the Seneca-Superior Company on the list of next year's producers, and will lend much encouragement to such mines as the Provincial.

The total average working cost of ore mined and milled at the El Oro mine, during the year ending June 30, 1912, was $3.79 per ton. This includes a development charge of 65 cents per ton ,and 23 cents per ton for Mexican, State and Federal taxes. Due in part to disturbed political conditions, mining costs exceeded those of the previous year by 34 cents per ton.

SPECIAL CORRESPONDENCE

MORE HISTORY.

Editor, Canadian Mining Journal:

Sir,—In the special issue of your periodical (July 1, 1912) in an article entitled, "The Special Research Work of the Mining Department of McGill University" the statement appeared that "McGill was the first of the Canadian Universities to give instruction in mining and metallurgy as a regular course in 1871." Commenting upon this your footnote mentioned that "Queen's University will dispute this statement." Your briefly worded, but pointed prophecy, has proved true, for in the last issue of the Canadian Mining Journal (Oct. 15, 1912, p. 699), under the heading "A Matter of History," Dr. W. L. Goodwin takes grave exception to this as "an extraordinary statement" and writes that "the facts are that up to 1893 no practical provision had been made anywhere in Canada for education in mining and metallurgy."

After an examination of the complete records the writer of this communication finds that the original

statement was correct. The course in mining at McGill University was established in 1871 and was therefore in full operation for 22 years prior to 1893. The late Dr. B. J. Harrington was appointed to take charge of the course; later he was assisted by J. Fraser Torrance, who had received a special training at Freiburg, and by W. A. Carlyle. The first graduate in mining was J. Fraser Torrance, B.A., who received his degree in 1873 after a three years' course. In 1873 the course was lengthened to four years. Upon his appointment Dr. Harrington secured a complete set of appliances such as were then considered essential from a practical standpoint to illustrate what was even then considered a very important course. Mining models and diagrams were provided and an extensive suite of specimens of ores and metallurgical products were collected or purchased and placed in convenient places for reference and inspection. Ore dressing laboratories alone were lacking to complete the equipment in a modern way for teaching mining and conducting the necessary research work. From 1873 to 1892, both years inclusive, there were 22 graduates in mining, among whom may be mentioned the following: W. Fleet Robertson (1880), Provincial Mineralogist of British Columbia; Dr. Albert P. Low (1882), Deputy Minister of Mines for Canada; W. H. Howard (1883), American Smelting & Refining Company, Garfield, Utah; E. P. Matthewson (1885), who, as manager of the reduction works of the Anaconda Copper Mining Company at Anaconda, Montana, has probably the foremost position in the smelting industry of the United States; Prof. W. A. Carlyle (1887), Professor of Metallurgy, Imperial College of Science and Technology, South Kensington, London, England; W. F. Ferrier (1887), formerly geologist to the United States Smelting & Refining Company, and now general manager of the Natural Resources Exploration Company of Canada; C. H. Macnutt (1888), General Manager Poderosa Mining Company, Antofogasta, Chili; C. B. Kingston, of Lewis & Marks, Johannesburg, Transvaal, S.A.

Indeed, I think it may be said without fear of contradiction, that during a similar period no mining school in North America has produced so large a proportion of graduates who are occupying the highest position in the mining and metallurgical professions. Honour to whom honour is due.

Yours truly,

ALFRED E. BARLOW.

Westmount, October 20th, 1912.

POTASH, SILICA AND ALUMINA FROM FELDSPAR.

By Edward Hart.

Paper presented at the Eighth International Congress of Applied Chemistry, New York, 1912.

In a study of the commercial utilization of feldspar, which I undertook several years ago, it soon became evident that the potash alone would not pay the cost of extraction. This is the cause of the commercial failure of all the methods heretofore proposed. It is necessary, therefore, to separate and put into marketable form other constituents—silica and alumina—if our method is to be successful.

With this purpose in view I have finally worked out the following process which gives good prospect of commercial success:

The feldspar chosen should contain not much less than 12 per cent. potash. Spar of this quality can be obtained in quantity, but one of the pitfalls inventors must avoid is the expectation of getting spar containing the theoretical 16.9 per cent. of potash. The spar mixed with the proper amount of potassium sulphate and carbon is fused. The carbon added is so regulated that the resulting slag contains a considerable proportion of sulphids. This has the double advantage of saving a part of the sulphur, disengaged as hydrogen sulphide on dissolving in acids, which aids also in the complete decomposition by breaking apart the particles as it is given off. Experiments show that if a colourless slag is obtained of even higher alkali content it is much less easily decomposed by sulphuric acid.

The slag so obtained must be very finely pulverized and treated in closed vessels with dilute sulphuric acid, leaving behind a very pure silica which only needs washing and ignition to yield a marketable product fitted for the potter's use or for the manufacture of sodium silicate.

The solution contains potash, alum and any small amounts of other metals such as iron, manganese and soda as sulphates. Lime is inadmissible, as the sulphate forms crusts on evaporating.

The solution on cooling gives at once crystals of alum, which washing with a little water and centrifuging renders marketable. Any iron present remains as ferrous sulphate in the mother liquor. Alum, however, is marketable only in limited quantity and must be, for the most part, converted into its constituents, aluminum and potassium sulphates. This is easily done by adding to the solution in a closed vessel potassium sulphide in slight excess when aluminum hydroxide mixed with a little sulphur precipitates in a form easily washed. This is dissolved in hot sulphuric acid, run through a filter and allowed to solidify. The potassium sulphate is obtained by evaporation.

Each ton of feldspar (12 per cent. K_2O) should yield
444 lbs. K_2SO_4.
2,040 lbs. commercial aluminum sulphate (18% Al_2O_3).
1,300 lbs. SiO_2.

PUBLICATIONS RECEIVED.

Statutes of Canada—1912—Acts of the Parliament of the United Kingdom of Great Britain and Ireland passed in the Session held in the First and Second Years of the Reign of His Majesty King George V.—Imperial Orders in Council and Treaties Negotiated and Public General Acts, and Local and Private Acts of the Canadian Parliament—Ottawa, 1912

The Quarterly of the Colorado School of Mines—October—1912—Issued by the Colorado School of Mines, Golden, Colorado—Contains an instruction scheme of classification for applying to mining information.

Electrical Symbols for Mine Maps, by H. H. Clark—Technical Paper 22—Bureau of Mines, U. S. Department of the Interior—1912

Report of the Department of Mines, Western Australia, for the year 1911—Perth, 1912.

Statistics of the Clay-Working Industries in the United States in 1911, by Jefferson Middleton—Advance Chapter from the Mineral Resources of the United States for the year 1911, Washington—1912.

LITERATURE AND MINING.

A Lecture Delivered Before the Engineering Students of the University of Toronto, by J. C. Murray.*

The relation of literature to mining has always been unsatisfactory. Although the literary workers of the past and of the present owe much to mining that debt has neither been paid nor recognized. The existence of this debt needs no proof. I need only mention one of the several devices whereby ingenious authors relieve impecunious heroes. The English novelist creates rich gold mines in vague Australia; the American novelist usually prefers the Western States. However, there appears to be a well-grounded belief in certain literary circles—manufacturing circles is a better phrase, for the average novel is truly a manufactured article—that mining is the only honourable means whereby a man can become suddenly rich without selling his soul. And there is some real basis of fact behind this. Hence it is that in the pages of modern fiction many scores of bronzed, bearded, brawny lovers have returned from Australian "diggings" to crush their usually anaemic betrothed in their yearning arms. So, also, mining endows many a deserving character in fiction with unhoped-for affluence. Usually both authors and readers can lay claim to a profound and absolute ignorance of everything pertaining to the industry. This seems to apply even to the few authors who have written novels that purport to be devoted to mining matters. I remember one novel, the scene of which was laid in the Coeur D'Alenes. The author was—perhaps is yet—a lady. She set herself calmly to work to disorganize the bowels of the earth. She controverted all the fundamentals of geology, and introduced radical changes in stamp-mill practice. I remember that the stamps of a 10-stamp mill were described as weighing hundreds of tons. This sufficiently shows the degree of accuracy that can be expected from the lay writer.

The time has come when better things can be hoped for. Ten or twenty years ago the mining engineer was regarded (and here I use a cheerfully contemptuous phrase coined by an English professor occupying an important chair in one of our universities) as an "educated plumber." The phrase loses half its value when it is not pronounced in the ultra-English dialect with substitution of "ah" for "er"—the last syllable.

Times have changed. Even at universities the mining engineer is looked upon as a more or less intelligent person. The public has begun to think well of him and to expect much of him. And gradually, through a series of reactions, the public is becoming better informed as to mining. Hence I believe the day will arrive when aspiring novelists will no longer dare to take undue liberties with the principles and practice of mining. Half a century ago, for instance, Mrs. Humphrey Ward could have misplaced North Bay with impunity. But to-day she is suffering for her lack of consideration. Similarly with mining. The author who can now perpetrate the grossest solecism about mining without suffering for it, will be brought severely to book by the more critical reader of the future.

These generalities, however, are not what I intended to inflict upon you. With some indefinite intention of showing how much to interest him specially the mining man may find in general literature, I begun to throw together a few notes. Lack of time and pressure of work have made it quite impossible for me to put these notes in coherent form. I must ask you to accept them as they are.

Perhaps in any library the department of travel will be found richest in allusions to mining. But many historical works contain much that interests the mining engineer, those of Parkman and Prescott, for instance, being liberally sprinkled with references to mining matters. Search for such references is hardly to be considered a worthy object in itself, but encountering them certainly adds zest to one's reading.

Lately I have been re-reading a few books that occupy places of honour in my small library.

The first book that I wish to glance over is the English translation of one of the greatest books of travel ever written—The Travels of Marco Polo, the Venetian. I may refresh your memories by reminding you that Marco Polo was born in the year 1254. His father and his uncle were dauntless travellers. Together they spent almost nine years in travelling between Venice and Cathay, where they visited the mighty Kubla Khan whom Coleridge immortalized. A vivid imagination indeed would be required to picture the perils and hardships of that long journey into mysterious and unknown regions. It is no wonder that young Marco Polo's ambition was roused by the travellers' tales.

Marco's father and uncle returned to Venice in 1269. They had been commissioned by Kubla Khan to bring back with them 100 missionaries to operate upon the Cathaians. This they could not do without the permission of His Holiness the Pope. It happened that there was a papal interregnum, no successor to Clement IV. having been elected. After waiting for two years for the new Pope, Gregary X., to be elected, the Polos succeeded in getting two Dominicans. The hardships of travel very soon frightened these two worthies, and the three Polos—father, son, and uncle—started without them on their tremendous journey across Asia. Four years it took them to reach Shangtu where Kubla Khan held court. Young Marco Polo immediately achieved popularity and rose in honour and wealth until he became one of the most important men in Kubla Khan's wide dominions. Not until the year 1295, after twenty-four years of absence, did the Polos see Venice again. The book that has come down to us was dictated to a Genoese scribe by Marco Polo during his imprisonment for a political offence, four years after his return. Cameras, note-books and fountain pens were not current in those days. The traveller, therefore, had to trust to his memory. And it takes one's breath away to think that Marco Polo could remember details of his travels so accurately that much of his description holds good to-day.

We have to do, however, with Marco Polo's allusions to mining and kindred matters. It will not be necessary to go farther into biographical details. Chapter IV. of Marco Polo's book opens with a reference to a "rich mine of silver," within a castle named Paipurth in Armenia Major, and closes with a paragraph on the Zorzaman (the Kingdom of Georgia) oil springs—the marvellously rich Baku oil field of to-day. "A fountain of oil," says Marco, "discharges so great a quantity as to furnish loading for many camels. The use of it," he continues," is not for the purpose of food,

*Editor, The Canadian Mining Journal.

but as an unguent for the cure of cutaneous distempers in men and cattle; as well as other complaints; and it is also good for burning. In the neighbouring country no other is used in their lamps, and people come from distant parts to procure it."

It is impressive to learn that the Baku gushers have been supplying the needs of a large population for many centuries. As I do not intend to introduce any statistics into this brief talk, I shall merely state that the Baku fields in Southern Russia are to-day of enormous commercial importance.

The extensive Kingdom of Badakhshan, near the modern Afghanistan is described by Polo as being rich in minerals. "In this country," he writes, "are found the precious stones called balaso rubies of fine quality and great value, so called from the name of the province. They are embedded in the high mountains, but are searched for only in one, named Sekinan. In this mountain the King causes mines to be worked in the same manner as for gold or silver; and through this channel alone they are obtained; no person daring under pain or death, to make an excavation for the purpose, unless as a special favour, he obtains his Majesty's license. Occasionally the King gives them as presents to strangers who pass through his dominion, as they are not procurable by purchase from others, and cannot be exported without his permission. His object in these restrictions," as Polo quaintly expresses it, "is, that the rubies of his country. . . . should preserve their estimation and maintain their high price; for if they could be dug for indiscriminately . . . . . so great is their abundance, that they would soon be of little value." . . . It must comfort the spirit of that departed King to know that rubies are still embarrassingly precious. "There are mountains likewise in which are found veins of lapis lazuli. . . . the stone which yields the azure colour, here the finest in the world. The mines of silver, copper and lead are likewise very productive."

As Marco Polo proceeded through each succeeding province or kingdom he made mental notes of its resources. In many cases, as in that quoted above, he dwells especially upon the minerals chalcedony, onyx and jasper are frequently mentioned. Silver less frequently; but gold is often referred to.

Near the capital city Kain-du in Eastern Tartary, the lake pearl fisheries attracted Polo. Here also the ruler restricted the search for these precious articles for fear of glutting the market. This monopoly and close control of mining was characteristic of the times, and was given the colour of wisdom by the very limited markets.

In consequence of the abundance of gold found in the rivers of the Province of Karazan (the modern Chinese Province of Yun-nan) gold was worth only six times as much as silver. Even then, there was a profitable business in exchanging silver for gold and vice versa in countries where the relative value of each metal was different. Five days' journey westward from Karazan lay the Province of Kardandan. Here is an interesting excerpt:—

"The currency of this country is gold by weight, and also the porcelain shells. An ounce of gold is exchanged for five ounces of silver. . . . . there being no silver mines in this country, but much gold, and consequently the merchants who import silver obtain a large profit." "Both the men and women," adds Polo, "have the custom of covering their teeth with thin plates of gold, fitted with great nicety." A form of vanity that survives to this day and generation.

Perhaps I have quoted enough to show that Marco Polo was consistently interested in the mineral resources of Mediaeval Asia.

I shall pass now to an author of a quite different type and of a later date—Mr. Samuel Pepys.

(To be continued.)

APPARATUS FOR CONTROL OF OVER-SPEEDING AND OVER-WINDING IN WINDING ENGINES.

From the Report of the Western Australia Department of Mines.

The following particulars of some of the appliances recently introduced for prevention of over-winding and of undue speed in winding have been obtained from the patentees and manufacturers, and are submitted in the hope that the information may be of service to mine owners and managers who may be looking for such devices.

Melling's Patent Controller for the prevention of overspeeding and overwinding in winding engines, made by the Worsley Mesnes Iron Works, Ltd., Wigan, England:

"The blue print enclosed illustrates generally the method we use in coupling up our patent controller to steam brake and to the stop-valve, and also shows a general arrangement of a post brake gear, including our patent adjuster for the purpose of taking up the wear automatically on the brake-blocks.

"The blue print referred to is reproduced on a reduced scale as Plate I. herewith, and Plate II, shows the controller more in detail, with letters as in the following description:

"This gear is for the purpose of making safer the working of winding engines—(1.) By providing means for controlling and stopping the engines in the event of the engineman failing to do so at the right time. (2) By controlling the speed of the engines during the wind to that which is fixed to be the maximum. (3) By gradually reducing the speed of the engines when nearing the end of the wind if the engineman has failed to so do. (4) By effectually stopping the engines when the extreme limit of the cage's movement is reached. (5) By stopping the engines at once by means of the emergency portion of the gear, should the engineman start them in the wrong direction.

"The overwinding gear for the above is made by preference in the horizontal type, but can be fixed vertically if desired. The gear can be placed either at the

side of the engines or between them, and can be fixed very readily on the engine-room floor.

"Motion is imparted to the machine from the engine-shaft or drag-shaft, by means of a roller chain and tooth wheels, one wheel being keyed on the crank shaft or drag shaft, and the other wheel being keyed on the shaft B (see illustration). On this shaft B there is keyed a mitre wheel which drives the screw shaft E, and also another sprocket wheel which drives the governor by means of a roller chain. On this screw shaft E is fitted the nut or block F which has on it the raised end pieces or catches F1 and F2. During one wind, this nut F is traversed along the screw from one end to the other. In the illustration it is shown as being mid-way of its traverse, and the notched bar G (which is held in position by the governor) is shown also in its mid-position, as would be the case when the engines were running below their maximum speed. The governor is so adjusted as that the maximum working speed of winding is not sufficient to bring the notched bar G into contact with one or other of the steel catches F1 and F2, but if from any reason this maxi-

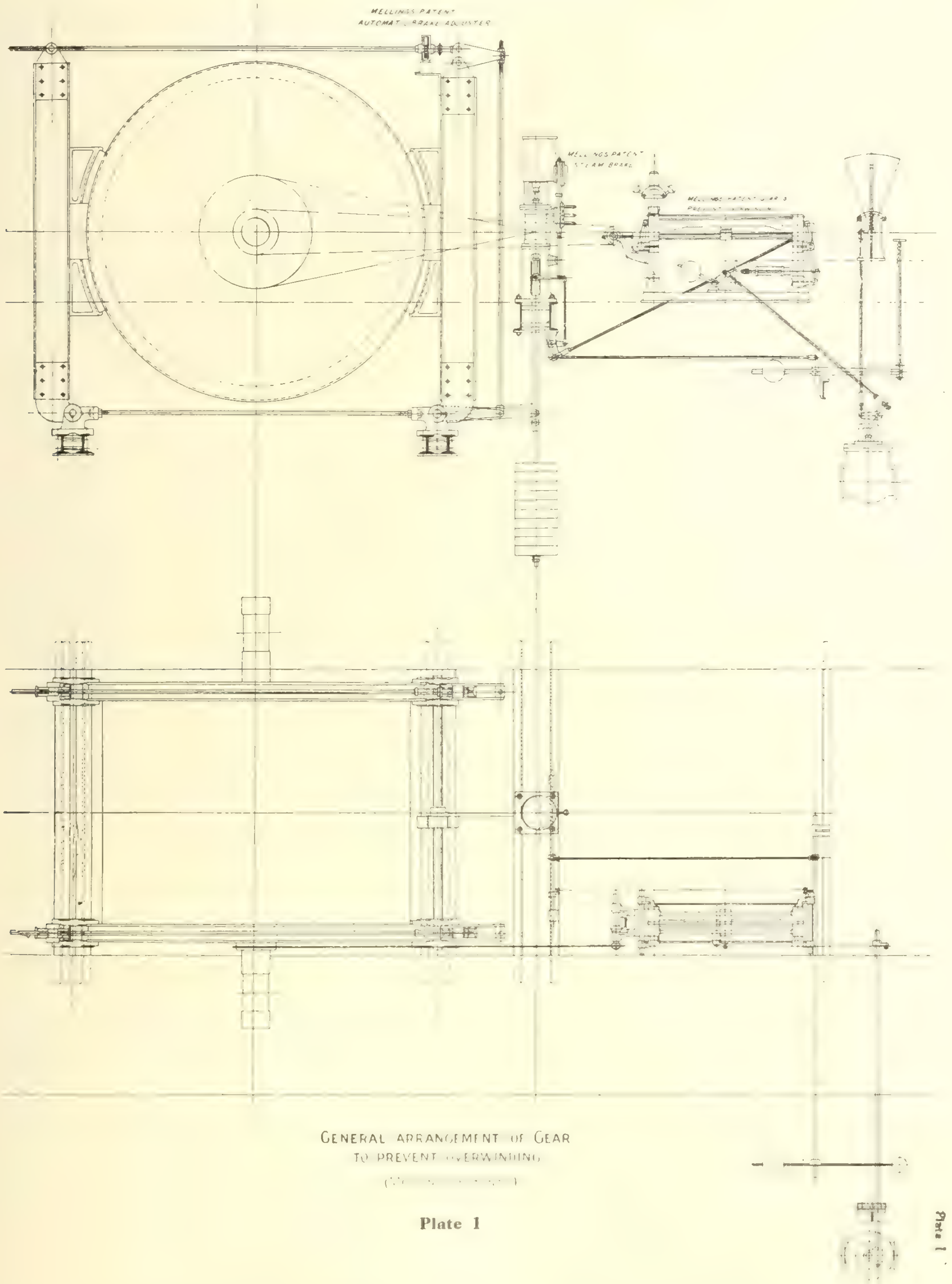
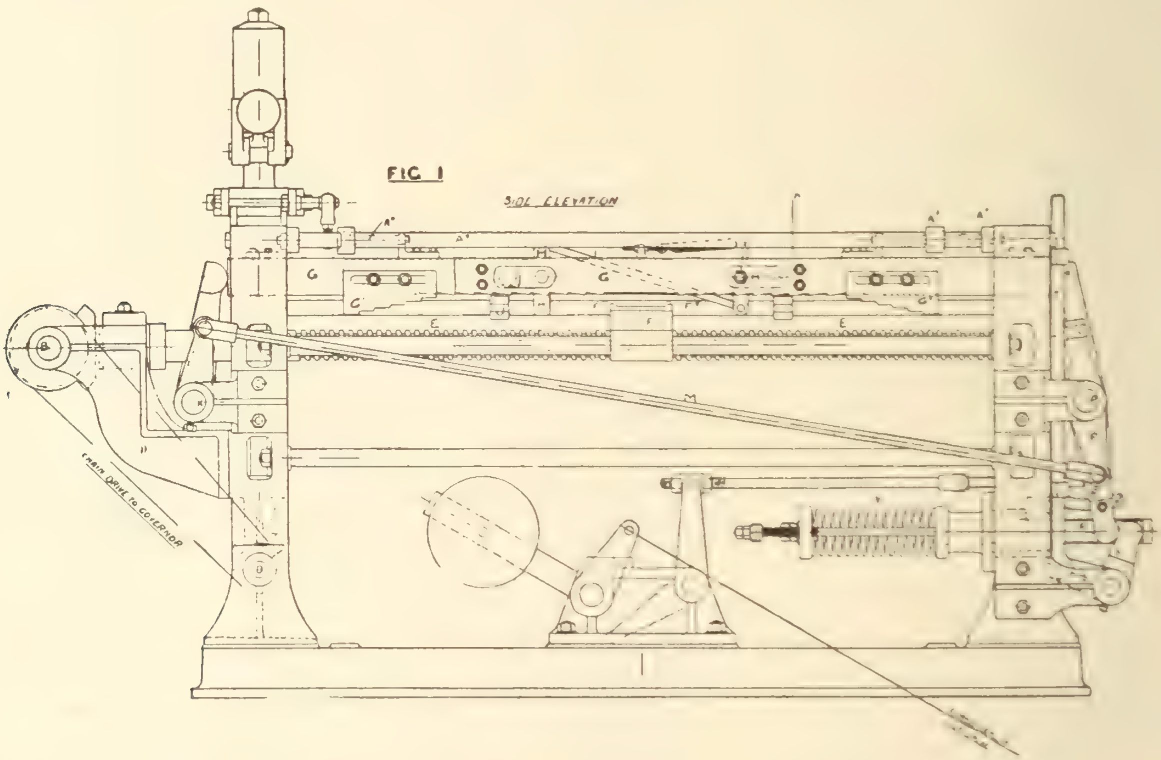


Plate 1

mum speed is exceeded, the governor rises to its top position, brings the bar G into contact with the catches F1 and F2 on the nut F, and is immediately traversed along the nut. When the notched bar is moved by contact with the nut, this operation immediately closes the stop valve by means of a trip mechanism (shown on the top of the baseplate in the centre, in the illustration) and applies the brake. The period of time in which this latter operation is completed can be regulated so as to bring the brake on with freedom from sudden jar or strain, and the engines can be brought to rest in from, say, three to six revolutions of the drum. If the engines run at their proper ordinary rate, and are checked at the right time, near the end of the wind, by the engineman, the notcher bar G will of course be kept quite clear of the steel catches. Near the end of the notched bar G adjustable step pieces G1 and G2 are fitted, which are for the purpose of ped to its closed position, and the brake immediately applied; this will cause the engines to be effectually stopped in not more than five feet above the ordinary working level. This condition of safety would also be secured if the engines were started in the wrong direction. On the lever R is carried a catch R1, which can be held by the rack R2 for the purpose of keeping the brake on until the rack R2 is lifted up, when, if brought into action from overspeeding only, the bar G and the controlling levers are automatically brought back again into their normal position, and the engineman is free to take his brake off and open his stop valve again. When brought into action by means of the emergency arrangement, all that is required to put the gear into its normal working condition is for the engineman or an assistant to lift up the bar T by means of a spanner, which is made to fit on the hexagonal boss of the lever P1, until the lip T1 again rests



Melling's Patent Controller, for the Prevention of Overspeeding and Overwinding.

Plate 2

slowing down the speed and stopping the engines at the end of the wind, if the engineman has failed to close his stop valve at the right time.

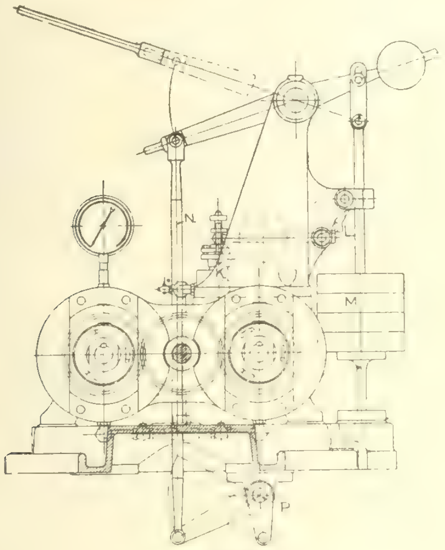
"If desired, the gear may also be made to reverse the engines in addition, when required.

"At the end of the wind, if the engineman has failed to stop the engines before the cage has risen above the fangs or catches a predetermined distance, say two feet, then a bar, O, which is secured to the nut, comes into contact with either of the levers which are connected together by the coupling rod M2. One of these levers P1, i.e., the one which is keyed on the shaft P, has an end, U, which is held in position under a lip or shoulder on the bar T, by the spring V. As soon as the bar O on the nut comes into contact with either of the levers coupled together by M2 it immediately knocks the lever U out of the lip on the bar T and the spring V causes the stop valve to be instantly tripped to its closed position, and the brake immediately applied; on the end of the lever U, the stop valve and brake are then free to be operated.

"All the parts are very compact, strong, and easily accessible for examination, and the space occupied is approximately 6 ft. long, 1 ft. wide, and 1 ft. 6 in. high.

"Our Melling's Patent Automatic Brake Adjuster has been designed with the object of having the engine brakes automatically adjusted without attention from the engineman, and as it is important that the brakes should act with certainty and regularity, the brake adjuster takes up the wear as required, so that there is not any excessive movement of the steam brake required at any time to tighten or put on the brakes. The arrangement is constructed so that the actual 'screwing up' of the brake is done during the 'off movement,' much less strain being thus put on to the gear. The movement of two of the posts or straps, combined with the bell-crank levers at the top ends is sufficient

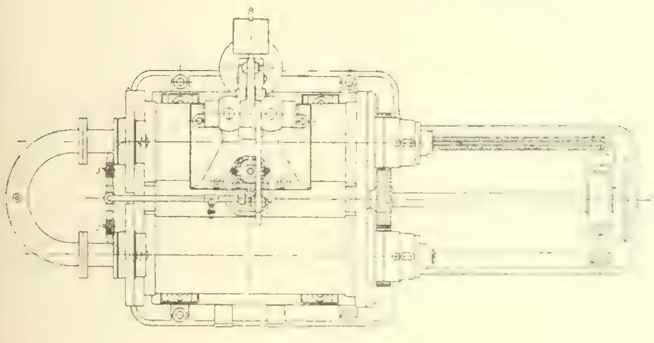
to operate a lever which turns a toothed wheel by means of a catch; this wheel being keyed on to the main tension screw. The amount of movement of the posts or straps required, or in other words, the amount of travel of the Steam Brake Piston in order to tighten the brakes, is not much, but as the wear on the blocks



END ELEVATION

OF

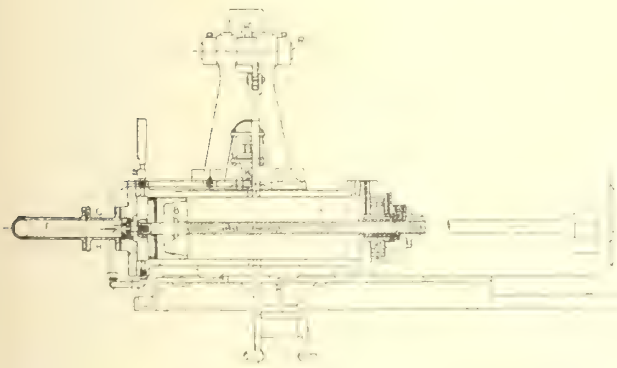
WILDE & PETRIE'S PATENT OVERWINDING and OVERSPEED CONTROL



PLAN

OF

WILDE & PETRIE'S PATENT OVERWINDING and OVERSPEED CONT...



SIDE ELEVATION

OF

WILDE & PETRIE'S PATENT OVERWINDING ...

Plate 3

increases, this travel or movement increases until the catch lever has moved the toothed wheel another tooth round. The whole arrangement in no way causes extra wear on the brake blocks, as it will be readily seen that should it so happen that the brake blocks were particularly hard or unwearable, automatic adjustment would only take place very rarely.

"The whole arrangement of the overwinding and brake gear, combined with our Melling's Patent Steam Brake, is of the most modern design, and gives by its adoption, certainty and confidence to those who use them, and is one of the best and most efficient means that could be adopted for safety in modern winding, and has been proved absolutely reliable after 12 months of continuous working."

Wilde and Petrie's Patent Overwinding and Overspeed Controller for Winding Engines, made by Walker Bros. (Wigan), Ltd., Pagefield Iron Works, England.

"The object of this gear is to prevent a winding engine running at a dangerous speed and to arrest the engines should the cage pass the keys beyond a safe limit at the termination of the wind; also to prevent the engines being started again in the same direction should the man omit, by oversight, to reverse his levers.

"The gear consists of the twin cylinders AA, in which plungers BB are moved to and fro by square threaded screws in opposite directions to each other, and at a speed directly proportional to that of the cages.

"The screws are rotated by spur wheels D in the front cylinder covers, which receive their motion from a sprocket wheel E and chain or other suitable gearing connected with the crank shaft of the engine.

"The spur wheels are fitted with ball thrust bearings on either side to take up the end thrust of the pistons. At the back end of each cylinder is a non-return valve G, opening inwards with a small orifice in the centre, and on the piston end of each screw is fixed a taper needle valve, H, which at a fixed point in the wind enters the orifice.

"The needle valve is of such a diameter as to close entirely the latter as the piston approaches the end of its stroke.

"Leading from the bottom of the back end of each of the twin cylinders are pipes communicating with a plunger K, placed above the two cylinders, and connected by means of a trip gear L, with the throttle valve and brakes, which are actuated by the descent of the weight M, and the consequent movement of the bell crank P.

"These pipes, which each contain a non-return valve, J, the space between the backs of the pistons and the connecting pipe, F, are entirely filled with oil or other suitable fluid. At the start of the wind, the piston B, which is in a position next to the spur wheels, and not as shown on the diagram, begins to force oil through the orifice in valve G, and through the pipe F, into the other twin cylinder.

"As the velocity of the cages increases, so does that of the oil flowing through the valves G. Hence the pressure of the twin cylinders necessary to force the oil through the orifice varies with the speed of the cages.

"The method of working is as follows:

"At the fixed point in the wind precisely when the engine winder should shut off steam and apply the brakes, the needle H enters the orifice of the valve.

"Thus the effective area for the passage of the oil from one cylinder to the other is gradually decreased, and if the speed of the engines does not vary proportionately, the pressure of the oil rises, lifts the plunger, and so closes the throttle and applies the brakes.

"In the event of starting in the wrong direction, since the needle valve completely blocks the orifice in

the valve G, the slightest movement of the piston at once raises the oil pressure and actuates the mechanism.

"The connections of the trip gear to the throttle valve are such that the engine winder may regain control of the latter by simply drawing his handling lever back to the closed position, but the steam brake cannot be released until the trip mechanism is reset.

"The main advantages of this gear are as follows:

"Positive action being independent of a centrifugal governor and hence ready response to any change of speed.

"Simplicity of design with the pin joints and idle parts reduced to a minimum.

"Easy adjustment to suit varying conditions.

"Simple application to any existing engine. (Plate III.)"

ginning if the engineman starts the engines in the wrong direction.

"By the arrangement of two governors at different speeds, the operation is as follows: No. 1 governor is set so that if the engineman does not reduce the speed of the engines, say, at four or five revolutions from the point of landing, the cams on the revolving shaft come into operation, and so shut off steam and apply the brake. If speed has been reduced on No. 1 governor allowed the cams to pass the Nebs, and the engineman does not continue to reduce the speed, No. 2 governor will come into operation at a point, say 1½ or 2 revolutions from landing. The speed of the engines now being so reduced that it is almost impossible for an overwind, but should the engines still keep revolving, an arrangement fixed in the headgear in the path of the cages would again bring the 'Visor' into

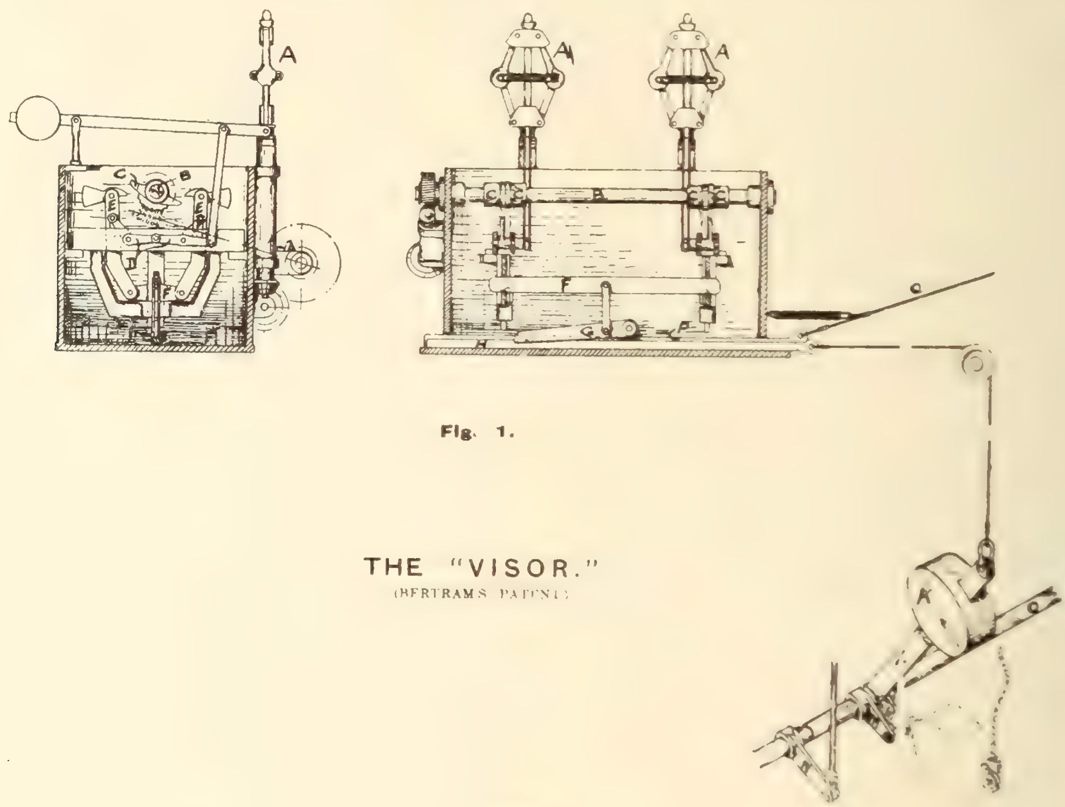


Fig. 1.

THE "VISOR."
(BERTRAM'S PATENT.)

Plate 4

Bertram's Patent Visor for Prevention of Overwinding and Starting Engines in the wrong direction, made by John Wood and Sons, Ltd., Barley Brook Foundry, Wigan, England.

"The approximate price of the 'Visor,' packed for shipment and delivered f.o.b. Liverpool, is about £120, and the approximate weight when packed is from 16 to 20 cwts.

"We have supplied and installed up to date about 150 machines in various parts of the country, also South Africa, and have supplied the same to other engineers on this side for shipment along with engines of their own particular build.

"We may also add that the 'Visor' has been laid before the Home Office. It complies with the proposed new Mines Regulation Act now before the House of Commons, and is also referred to in the Blue Book, pages 10, 11, and 12 of our Royal Commission on Coal Mines, etc.

"As is well known, the 'Visor' not only prevents overwinding at the end of a run, but also at the be-

operation and to stop his engines. This latter device has been arranged more particularly to prevent an accident should the engineman make a mistake by not reversing his engines, and, therefore, starting the same in the wrong direction.

"It will be seen, therefore, that the engineman can neither make a fast nor slow overwind.

"During a winding every piece of mechanism of the 'Visor' is working, therefore, there is no fear of it failing to act when required through sticking. This has been proved many times where the 'Visor' has not come into action for months and then acted when it was found the engineman had failed to do his duty.

"The 'Visor' is applicable to any class of winding engines, whether new or at present working, without necessitating a new brake, providing the present brake is efficient.

"Each 'Visor' is sent out with worm wheel and gear for driving from engine shaft, and all attachments to pit head frame, starting valve and brakes. Where it is

impossible for one of our engineers to see the engines, the following particulars are required to enable us to send the 'Visor' ready for fixing:

"1. Number of revolutions of drum per wind.

"2. Maximum speed of engines during wind.

"3. Number of revolutions from end of wind, when steam is shut off.

"4. Sketch showing methods of working starting valve.

"5. Sketch showing methods of working steam brake.

"6. If there is no steam brake, sketch showing type of foot brake, and how worked.

quired positions. As the speed of the engines gets up, first one and then the other governor flies out quickly, and throws (through the medium of levers D), the vertical arms E with hooks attached inwards, bringing the said hooks in line of contact with beaked cams C. When nearing the end of the wind, if the engines are brought to rest in the usual manenr, the governors fall, and bring back the hooks out of the line of contact.

"If, however, through any cause whatever, steam is not shut off at the usual point, or the engines not being slowed down, the hooks make contact with the beaked cams C, and thus lift up the sliding frame and

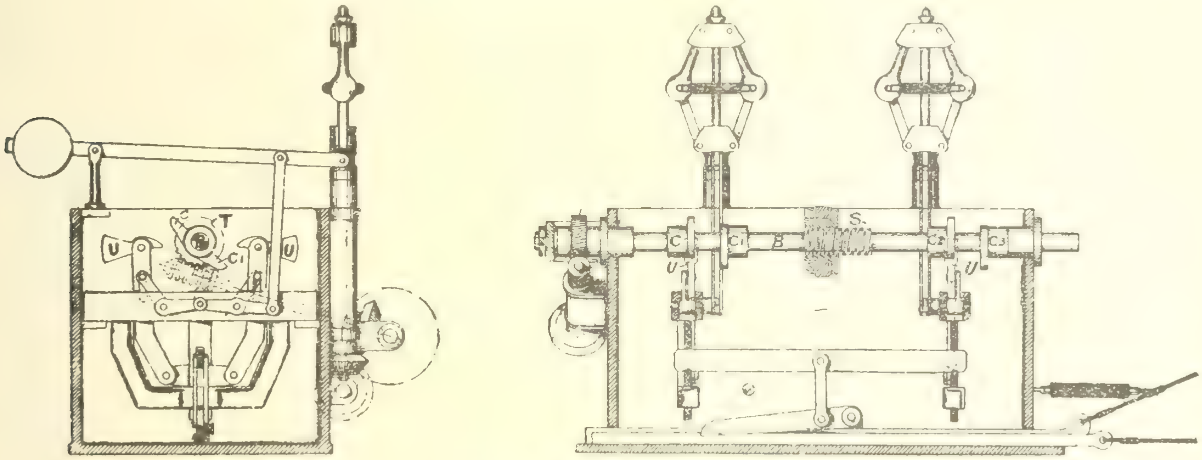


Fig. 2.

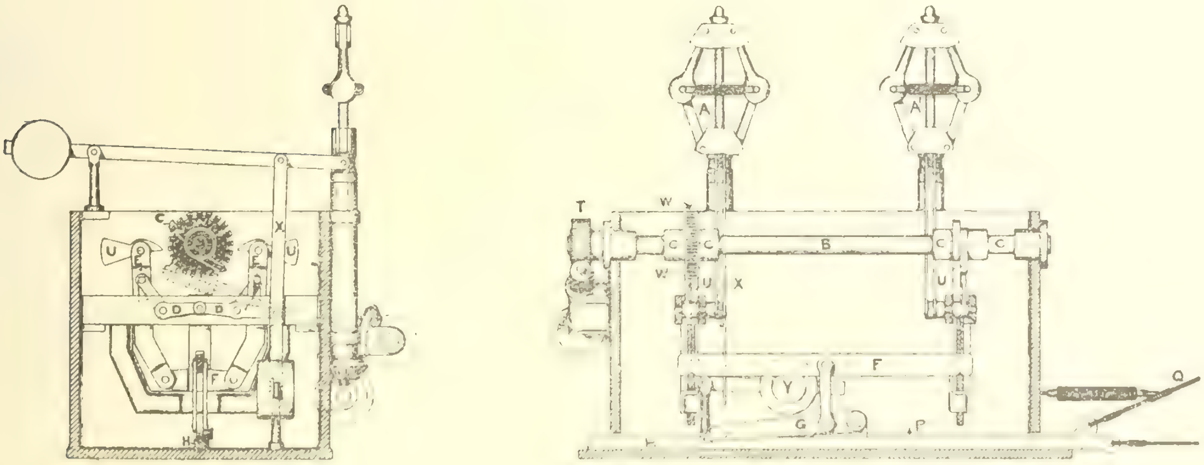


Fig. 3.

Plate 5

"7. Sketch showing room available on crank or drag crank shaft for fixing 'Visor' driving wheels.

"The illustration (Plate IV., Fig. 1) has been specially prepared to show how the 'Visor' does its work, and it must be understood that the positions are not drawn with absolute accuracy.

"The governors (A) which act only as speed indicators are driven by suitable gearing from the crank or drag crank shaft of the winding engines, as also is the worm wheel shaft B; the latter shaft makes approximately one revolution per winding, and carries the beaked cams C which are adjusted to the exact re-

bar F; this is connected to the pawl G, which being lifted out of the notch in the bar H, releases the same, and as this holds the weight K in suspension, these immediately fall, and respectively close the starting valve, and apply the brakes.

"The arrangement of levers for closing the valve, or applying the brake is the one most commonly used, but it will be easily understood that local arrangements necessarily entail special designs to suit.

"The one shown acts as follows: O is the actuating shaft for the starting valve or steam brake (as the case may be), and is worked by the engine through

the lever N, which is keyed on. On this shaft are also keyed, double levers M, with the loose lever L, between the same. On the lever L is the weight K, which is held in suspension by a cord attached to the draw bar H of the 'Visor.' When the engineman is working this shaft, the lever L is stationary, and the levers M work up and down underneath it. When the weight is released by the 'Visor' it falls and forces the lever L on the levers M, which, being keyed on turn the shaft and close the starting valve, or apply the brake. Of course, two of these arrangements are necessary, i.e., one for the starting valve, and one for the brakes.

"It will also be noticed that in the 'Visor' there is a second draw bar P, which is connected by the wire cord Q to catches in the pit head frame. These are fixed over the cages, so that, should the engines be started in the wrong direction, the draw bar P is pulled out, and will, as seen, release draw bar H, and stop the engines.

"It will therefore be seen that so long as the engines are properly controlled, nothing out of the ordinary occurs, but should the engineman neglect his duty in any way whatever, then the 'Visor' steps in and does his work."

Messrs. Wood and Sons also make an improved patented arrangement for long winds shown in Plate V., Fig. 2, applying to the worm shaft, "which is given a longitudinal traversing motion, as well as a rotating motion, thus allowing the beaked cams to move at a considerably greater speed than heretofore. In a long wind with the worm shaft making only one revolution, and merely rotating, the travel of the beaked cam is very slow, and in the event of the apparatus coming into gear, apt to allow the engines to run too far, owing to the slow release. But with the longitudinal traversing motion, the cams can be made to revolve two or three times or more during the period of the wind, thus causing the apparatus to be released very quickly, and, consequently, steam shut off from the winding engine, and the steam brake applied.

"Description.—The worm shaft is threaded S, and the beaked cams C, C1, C2 and C3, are secured on the worm shaft in relatively suitable positions for the number of revolutions required. As drawn in the illustration, the worm shaft makes four revolutions per wind. The two beaked cams C and C1 are shown opposite the trips or hooks U in the positions occupied at the end of the winds. During the wind the shaft B is rotated by the worm wheel T, which is fitted on a feather key, to allow shaft to traverse through same. The screwed portion S, causes the shaft to traverse longitudinally, until at the end of the wind, the cams C1 and C3, come into line of contact with hooks U, and disengage the 'Visor,' unless the speed of the engines is suitably retarded in the usual manner."

Another improvement to prevent excessive speed of the winding engines is shown in Plate V., Fig. 3, which not only prevents overwinding and starting in the wrong direction, but also prevents the engine being run above a predetermined speed. To illustrate: A pair of winding engines when doing what is considered their full duty, attain a maximum speed of say, 60 revolutions per minute, or one revolution per second. It may, owing to peculiar local circumstances, be considered unsafe to run much above the speed, even when winding coal. Granted that this is so, then it is manifestly unsafe to attain a higher speed when lowering men down the pit, as, at this time, the heaviest weight is in the descending cage, the tendency is for the engines to race. In such a case, we should recommend the Improved 'Visor' which, when the speed attained to, say, 65 to 70 revolutions per minute, would automatically come into action and stop the engines in its usual manner.

"Detailed description.—In connection with the slowest of the two governors A, there is arranged a multiple cam W, which is also secured to the worm shaft B. During a winding operation, when the engines are running at their normal speed, the hooks U, are, as previously described with the original 'Visor' thrown into the path of contact of the beaked cams C, but not sufficiently far as to engage in the notches of the multiple cam W. If, however, the speed be sensibly in-

Fig. 5

Fig 4

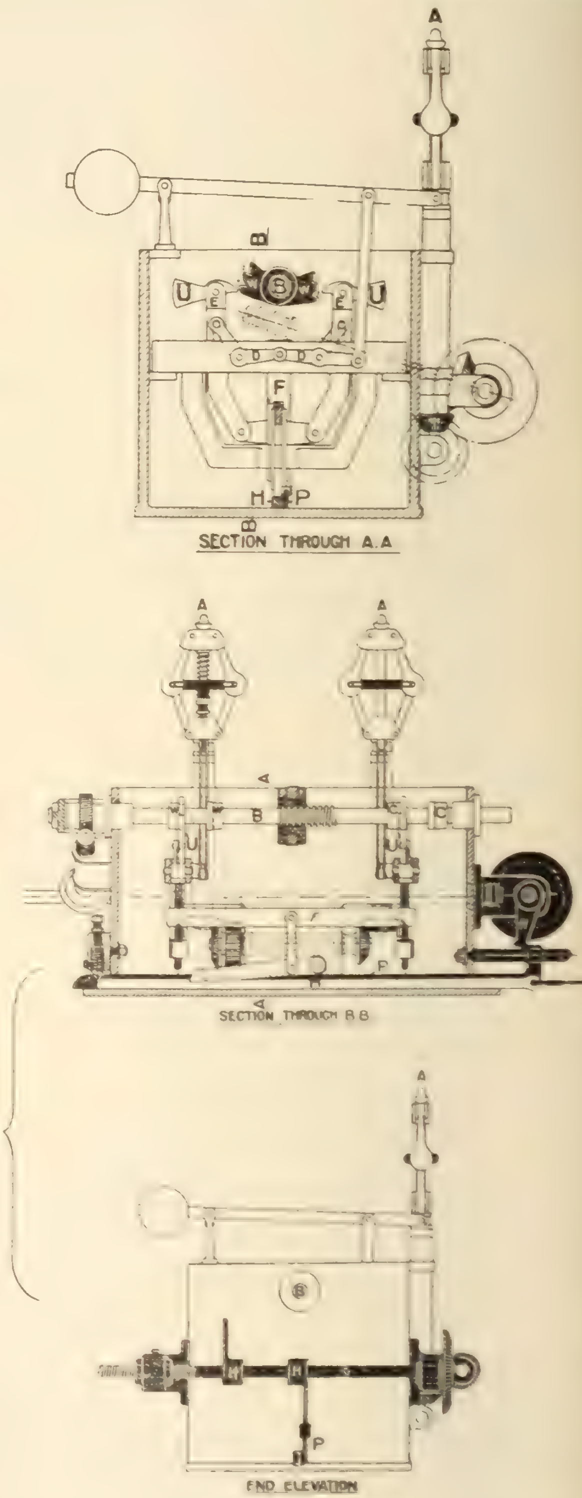


Plate 6

creased, say by five to ten revolutions per minute, then the governor A, by expanding still further, lifts the weight Y by the link X, and thus throws the hooks U into contact with the multiple cam W. This, of course, immediately releases the draw bar H, and the engines are brought to a standstill.

"It will be noted that this improved arrangement is in gear from the beginning to the end of the wind, so that at no point in the wind is it possible to exceed the minimum speed determined upon."

An improved device to prevent starting in the wrong direction is shown in Plate VI., Fig. 4. "A small shaft G at the end of the 'Visor' box is driven by bevel gearing from the drum shaft, and the ration of the gearing is such that the shaft G has approximately the same number of revolutions as the drum shaft. This shaft C is also given a cross traverse. Secured to the shaft C are two long cams H, which at the end of the wind (owing to the traversing motion) respectively come to rest just before the point of contact of the draw bar P. From this, it can be seen that should the cage after reaching banking out level, still continue to ascend, the cam H will immediately draw the bar P, and operate the 'Visor.' The same happens after banking out, should the engineman start the engines in the wrong direction. To show the quickness of the operation, it is only necessary to draw the bar P one-third inch. The radius of the cam H is four inches, and to illustrate—supposing the winding drum is 16 feet diameter, the radius is eight feet or 96 inches 96-4=24 to 1 ratio, ⅛in. of 24=3 in. travel of cage, to operate the 'Visor.'

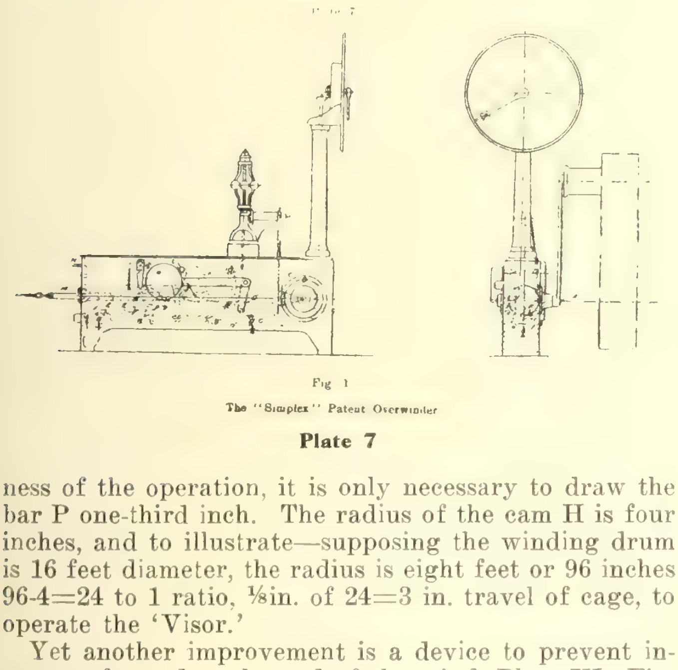


Fig 1

The "Simplex" Patent Overwinder

Plate 7

Yet another improvement is a device to prevent increase of speed at the end of the wind, Plate VI., Fig. 5. "After the speed of the engines at 4 to 5 revolutions from the end of the wind has decreased sufficiently for the cam to pass the hook in connection with the slow governor, there is arranged in connection with the fast governor A1, a three beaked cam W, secured to the worm shaft B. During the winding operations, when the engines are, say, from $1\frac{1}{2}$ to 2 revolutions from the end of the wind, and the speed is not sufficiently decreased, the hook U comes in contact with the first of the beaks on cam W. This, of course, immediately releases the draw bar H, and the engines are brought to a standstill. If the speed be slow enough to allow of the cam W to pass the hook U, and the steam be again applied so that the speed of the engine be increased, then the second of the beaks on cam W will be brought into the path of contact of the hook U, and the 'Visor' will be brought into operation.

"Should the speed of the engines be decreasing sufficiently to allow the first two beaks of the cam W to pass the hook, but not sufficiently to come to rest at banking level, then the last of the beaks would put the 'Visor' into operation just before the cage reaches the top."

Simplex Patent Overwinder, made by Robert Daglish & Co., Ltd., St. Helens Foundry, Engine and Boiler Works, St. Helens, Lancashire.

This overwinder is described in part as follows in The Iron and Coal Trades Review of August 4th, 1911:

"There are many such forms of apparatus on the market, but the present trend of legislation cannot fail to lead to further developments in this direction. There are certain essentials in such apparatus which in many otherwise excellent devices have been overlooked. The most important is, perhaps, the advisability of the mechanism always being in gear, i.e., forming part and parcel of the winding unit; as with anything in the nature of a stand-by, only called upon in a case of emergency, it too frequently happens that, when such call is made, the apparatus has, from rust or other causes (incidental to the lying-by), become more or less inefficient, if not wholly useless. The other essentials are positiveness of action, simplicity and accessibility of the working parts, and last but not least, economy in initial cost. No maker of repute will sacrifice in the smallest degree efficiency for economical production, but at the same time the requirements of the smaller or less prosperous undertakings have to be considered.

"These are the paramount considerations which have led Messrs. R. Daglish & Company, Limited, St. Helens, Lancashire, to evolve what they appropriately call the 'Simplex' Patent Over-Winder. They claim that it is the simplest and the least complicated of any that have yet been introduced, although it covers all the necessary points which have to be dealt with in an overwinder. The apparatus will retard the engine when the speed is slightly in excess of normal, and when three or four revolutions from the top. Should the engine speed be greater in the last three or four revolutions when approaching completion of the wind, or should the engineman by accident put on steam between these points, part of the braking mechanism will suddenly close the regulator or throttle-valve, and apply the brake with a pressure corresponding to the speed of the engine.

"The apparatus may be worked by gearing chain drive, or direct from the crank of the engine. This last method is shown in our illustration Fig. 1, in conjunction with which the following description explains the construction and working of the apparatus. The mechanism is driven from the crank of the engine on the shaft A, which drives the screwed spindle D through bevel wheels B and C. On the screwed spindle are two guide nuts EE, which can be adjusted to meet the required depth of shaft or wind, while fixed on the nuts are rollers FF, which actuate the wipers HH. When the engine commences to wind the nuts travel along the screwed spindle, releasing the wipers, which move upwards, drawing down the racked lever J. At the same time, the governor will rise, pushing forward the vertical rod K. Should the speed of the cage be slightly in excess of the normal in the last three or four revolutions of the wind, the governor will still hold the vertical rod K forward, and the rollers running down the wiper will force up the lever J, and engage with the rod K, drawing forward the trip rod M through the lever L, which will suddenly close the

regulator and apply the brake with a pressure corresponding to the speed of the engine.

"When the trip or braking rod is once drawn back to apply the brake, whatever may be the position of the governor, there is no release; the rod being notched at the end is held back by the sliding handle N. Should the engine from any cause creep away, or insufficient braking power be applied, and the cage reach a certain point above its normal position, one of the nuts EE will strike against one of the collars OO, fixed at opposite ends of the sliding bar G, which operates a double-movement bell-crank P, drawing back the catch lever T through the double-ended rod S, and thus quickly releasing the weight Q, which, being connected to the braking rod M, through the lever E, and the floating rod R, will close the regulator and apply full braking power to the engine simultaneously. Should the engineman start his engine in the wrong direction, the weight will be instantly released, performing the same operation as above.

"When the engine has made a partial overwind and the cage has come to rest before reaching the surface in the last three or four revolutions, the brake is thus only partially applied according to the speed of the governor, doing away with any heavy jerking at the cage and lessening the great strain put on the ropes by the sudden application of the full brake power. To release the brake, a small handle N is raised, when the brake is released, the throttle valve being free to engage in its former position. When the engine has made an over-wind, or the engineman started it in the wrong direction, the weight which has applied the full braking power will be lifted and the engine brought back to its normal running position.

"The indicator is of the column type worked with worm and wheel from the shaft A. It is fitted with a gong and large dial, and the pointer travels seven-eighths of a revolution for each wind. The 'Pickering' governor is worked from the screwed spindle by means of sprocket wheels and a roller chain."

AN APPEAL FOR CO-OPERATION.

By Walter Henry Prest, Bedford, N.S.

(Read before the Mining Society of Nova Scotia, March 27th, 1912.)

For several years the annual gold yield of Nova Scotia has been decreasing, with the probable future prospect of a still further decrease. There is no doubt that our gold resources are still valuable and the frequent discovery of rich float shows that bonanzas still exist, and yet a general loss of confidence, both in ourselves and our resources, is undeniable. What is the cause? Are we up-to-date? Do we keep abreast of other lines of business in working and business methods? Are we co-operating? I am afraid not.

For two generations the gold miners of Nova Scotia have struggled, each one for himself, as well as we knew or could, without organization, without sufficient funds, and without that patriotic feeling for the industry we represent, which, once expressed in energy would place gold mining in Nova Scotia on a respected footing. So through the decades we have struggled and waited, each gazing at the future from his own narrow point of view—the one his father left him. Through our own individual opera-glasses, so to speak, we have watched for the coming of our own individual capitalist. And while we watch, our provincial gold yield is dropping year by year and we are unable to stop it.

Prophetic geniuses, yet living, predicted prosperity from time to time, when each to-morrow would be a boom-day. Editors, politicians, and mining men joined in the happy chorus, yet did nothing. The most extravagant statements were made and believed. Promoters were loaded up with oratory and aimed at the long-expected capitalists from the United States. English capitalists were becoming interested. Low-grade ores would become the salvation of the gold mining industry in Nova Scotia. Our country would yet be a leader among the world's gold producers, and so on ad nauseum. In view of our decreasing gold yield, can we claim the fulfilment of even a fraction of these predictions? No doubt each individual owner has done his best. But it is like the proposed invasion of an enemy's country with an army that is ready, but each man of which is allowed to act alone, without organization, means, or expert advice.

Several years ago a friend of mine in Lunenburg County indulged in visions of a 60-stamp mill on a large deposit of low-grade ore. The vision of another friend pictured a 100-stamp mill on an immense deposit of an even lower grade. Still another capped the climax with an island full of an exceedingly low-grade ore, for which he only wanted a 100-stamp mill to start with. Each, as he imagined, was the worm in the apple for whose special benefit that apple seemed to have been made. Another, whose radiant face spoke a wealth of hopes, had a property with float rich enough to interest a Rockefeller. And I, your now thoroughly humbled servant, also had something rich enough to keep him poor ever since developing it! And each of these refused co-operation for the soundest of reasons, that as he could easily become rich from the yield of his own mine alone, it would be folly to waste time on properties of doubtful or unknown value. Other temporary combinations of high hopes and low-grade ores have been witnessed at Salmon River, Gay's River, Memramcook, and elsewhere. As far as I know, few of these experimenters in individualism have become rich, although nearly all are still holding their old areas, and still wearily looking for the capitalist that has never come.

Among the principal causes of our dwindling gold yield, are: (1) Not want of capital, but want of confidence. This is evident when we read that over $1,000,000 of Nova Scotian money is invested in Mexico. (2) Want of knowledge and skill in the workmen. (3) Want of funds by the actual owners. (4) Want of co-operation between the capitalist and the prospector. We have examples all over Nova Scotia of half-finished work, badly done work, badly located, scattered, and spasmodic work, and time wasted in waiting for and

searching for funds. As usual, those willing to work had little money, while those with money had little confidence in gold mining; so prospecting was often stopped on the verge of success and the money expended sacrificed.

Time after time false hopes have been raised by the incorporation of a professedly genuine development company. But the leading spirits therein were spirits indeed, for the companies they gave birth to soon disappeared from view. These spectral concerns usually embodied two principles,—viz., financial control from the inside and financial support from the outside, both destructive to a fair degree of co-operation.

We have co-operative creameries in Canada and co-operative commercial and manufacturing enterprises elsewhere, therefore, why not have co-operative gold mines? Perhaps it is needless to say that combination has replaced competition as a ruling principle in business, and a sub-principle of combination is that you help some one else, so that he can help you. Competition, however, still survives among the small men in their efforts to serve the big ones. The point is to awake to the fact that in union there is strength. Facts are convincing in themselves. The all important point is to inject the incentive that spurs men to action in new lines, to inspirit each one of us with the idea that his country will become great only as he becomes great, to fill us, each and every one, with ambition to grasp a principle that before seemed to be beyond our reach, I mean the principle of co-operation. I do not need to dwell on the benefits of co-operation, which is self evident to all who have struggled alone and unsuccessfully with a big problem.

In advising co-operation I am aware of the difficulties to be met with in getting men of varied opinions to work together. But greater difficulties have been met and conquered before, and could certainly be overcome now by those whose resources and confidence are equal to meet competition in the present struggle for existence. The chief of these difficulties will doubtless be the appraisement of undeveloped properties for the purpose of capitalization. There are those who usually drive hard bargains with the man who is down. There are those who may demand advantageous terms because they are in a position to do so. There is the man who not being a miner has an exaggerated idea of the prospective value of his property. There are others who insist on bonding. There are also men who have spent their last dollar in the work and who can help but little. Then there are some over-shrewd men who see in every proposition advanced, some scheme to injure them, but we trust these last are few. To offset these difficulties we must appoint as appraisers men of known probity and knowledge of the business in hand, and governed to some extent by rules agreed to beforehand. I have no doubt that the majority of owners will approve of any fair methods and rules for valuation and the rest will join after some progress has been made.

The appraisement of property for purposes of capitalization is in this scheme a very important question, and a difficult one, because in undeveloped or partly developed properties the values are chiefly hidden by surface soil, and no just comparison between them and running mines would ever be made by the ordinary mining engineer. They are, therefore, in a class by themselves. Mere extent of territory counts for little where the principal criteria of value in selection are the quantity and the importance of rich float.

There are the following points to be considered in such an appraisement:

First.—Quantity of gold-bearing boulders. An approximate plan should be prepared and on it jotted down the position, size, and character of each piece of gold-bearing quartz known to have been found there. The extent of ground containing fine gold obtained by panning, should also be noted down. Thus we get the quantity and limits of gold distribution, two important points in the consideration of an estimate of value.

Second.—Then comes a more difficult point—maximum value and quantity of rich float per ton, as estimated from loose quartz. This is nearly always exaggerated, often unintentionally so, and should be accepted conditionally or compromised.

Third.—The proportion, position, and limits of richest float should be carefully entered on a plan. This is a very important point, as under ordinary conditions of drift deposition, it indicates the extent of the paystreak proper, as distinguished from the poorer ore into which it usually passes. Two or three rich boulders close together usually indicates in undisturbed drift a narrow paystreak. Many widely distributed rich boulders indicate a very large paystreak. And yet we must be on our guard against the scattering influences of post-glacial modification. However, in the eastern districts the usually regular distribution of drift, makes this precaution of less account. The quantity of rich float found also depends largely on the amount of search that has been made for it. And as the location of the richest float is nearly always where many pits and trenches have been dug, therefore to allow value in proportion to the number of rich boulders found would in some cases depreciate unfairly the value of a comparatively unprospected property. I am paying particular attention, as you see, to the showing of rich boulders, because in order to insure a prize worth searching for, we should consider only the properties showing exceptionally good indications, avoiding all of doubtful value.

Fourth—Another point of value is the presence of known gold-bearing leads on the areas showing rich float. Unless they are known to contain pay-ore or are supposed to be the source of rich float, they would not add much to the prospective value of the property.

Fifth—Location on a pay-zone or fold in a district of undoubted value should be considered of some importance. Nearly all of us, however, are apt to build too high hopes on this aspect of the question. "On the same range," has always been a ready phrase luring many to financial ruin. With due respect to holders of opposite opinions, I would almost as soon be off the district as off the paystreak, let the range be where it may. Still like the previous point it should be considered in a question of prospective value.

Sixth.—The above five points deal with indications of value, but the following, pertaining to the costs of prospecting and mining, will either raise or lower the estimate of value already arrived at as the conditions to be considered are favourable or unfavourable. These points being distinctly different from the former, should not be touched on until an estimate of value from float ore, locations, etc., has already been decided on. This point, the depth and extent of the surface to be worked in, brings in the number and depth of the pits needed in prospecting. This has usually been considered the greatest bar to success in prospecting, often depreciating very much the prospective value of the property worked on. It is, however, not as serious an obstacle as much water. However, it greatly increases the cost of prospecting when done in the systemless

way so general throughout Nova Scotia. While deep surface is certainly a great drawback, it need not depreciate values much unless accompanied by a strong flow of water. As I showed in my recent paper on prospecting, much money could be saved by following up a carefully arranged programme planned on systematic lines, and only after a close examination of the ground to be worked over.

Seventh.—Another important point bearing on mining, even more strongly than on prospecting, is the quantity of water to be handled. Fortunate indeed is the Nova Scotian mine that is so dry that a pumping outfit is only a minor consideration. Prospectors who use a barrel for bailing are often subject to loss of time and frequent "drowning out" during heavy rains. An additional cost, especially in modified drift with its quicksands, water-worn gravels and other porous material, is the cribbing necessary to prevent caving. This, of course, lowers somewhat the prospective value of the property. The possibility of drainage means much both to prospector and miner of ore.

Eighth.—The presence of available water-power affects to a great extent the value of the property as a running mine; the difference in cost between steam and water-power often meaning "a mine" or "no mine." Therefore, the possession of water-power means an added value as compared to ordinary cases in which steam is used.

Ninth.—As steam is the power commonly used, I would propose making it the standard by which to compute the economy of water-power. But as the price of fuel, and some times labour, varies with locality, I would suggest making allowances for these differences in the cost of the production of steam.

Tenth.—An item bearing to a moderate extent on the cost of supplies, and also on the facilities for quick business, is the distance to the nearest post-office, frequency of mails, and distance to the nearest railway station or seaport. This would only apply seriously to a few of our mines, and in such places would have a bearing on the value of the property.

Eleventh.—The building of roads from mine or mill to government roads would affect costs during the earlier operations, as it is often impossible to get government advances for roads during the doubtful stages of mine work in isolated districts.

While this is only an approximate method of appraisement, it is about the best that can be made under the conditions. Conscientiously carried out, any deficiencies in this method of valuation would affect all undeveloped properties alike. The resulting values, considered as the purchase price, may be paid for in co-operative stock. Of course, in order to give to each contributor of property a fair return, the company should not be capitalized for more than the actual needs that the work in view calls for.

In order to ensure the reliability of workers, a preference should be shown to shareholders in the matter of employment. All employees should be urged to identify themselves with the company by the possession of a few shares of stock, thus ensuring to some extent their friendly co-operation.

To be sure that a foreman is fit for his position, I would have every man applying for such a job, pass an examination in the various duties pertaining to the work, and especially in the nature of drift transportation, and his ability to keep a record of work and plans that would be recognizable.

What is badly needed for the use of these men is a condensed handbook on glacial geology, shorn of all technical terms and worded in the phraseology of the mucker. Better a little slang, if easier understood, than an ignorant workman. Are none of our gold-mining friends in a position to supply the want? For its use is indispensable in the proper training of a prospector.

In selecting the first property for exploration several considerations should be looked into: Apparent value of float ore, depth of surface, and quantity of water. These seem to me to be the chief points. In my own work the extremes of cost in about 400 pits and trenches (of the most of which I have detailed plans) were from half a cent to seven cents per cubic foot, the latter cost nearly always caused by a large quantity of water. With data like this at our command we could estimate pretty fairly the probable cost of prospecting.

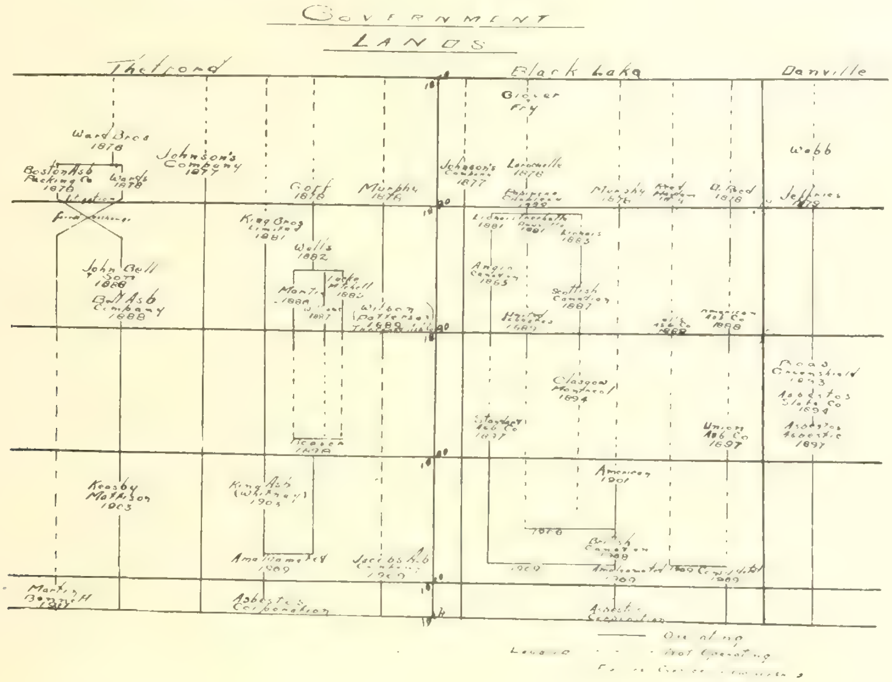
In conclusion I would like to refer once more to co-operation as applied to gold mining. Nearly all branches of business are organized, some socially, some commercially, some politically. Commercially, we, the gold miners of Nova Scotia, stand alone, each on his own precarious foothold. We are buffeted by circumstances and tripped up by each other, but of course legally and honorably according to the rules of the game. We cling to individualism as fondly and reverently as we cling to the two useless buttons on the sleeves of our coats.

Of course we all believe in co-operation, and if we object to it our chief reason is because it is so hard to convince the other man. But let the other man go. Time will convince him. It is chiefly competition that causes ninety per cent. of business failures in the lifetime of the average man. "Competition is the life of trade," said the lawyer, as he rushed his ruined clients through the insolvency court. But we gold miners need compete with no one, so we can afford to ignore principles moss grown with age and dank with the injustice of centuries, principles whose dying mutterings tell of ruined homes and broken hearts. Therefore, let us co-operate. Let us make an effort to arrest a dwindling industry, ensure future profits without the usual risks, and finally to show a provincial gold yield that we will not be ashamed of as at present. Do not wait for precedents or opinions long since relegated to a mouldy past. Let us show the world that we have confidence in ourselves and then it will have confidence in us. So let us awake and get to work and forget not that our progress means to a certain extent the progress of the land we live in. And finally, may I dare to express the opinion that the greatest patriot of all is the man who elevates himself and his country by labour rather than by shedding the blood of some foreign patriot.

ASBESTOS HISTORY.

BY W. J. WOOLSEY, M.E.

The asbestos industry has grown to considerable proportions and the public generally are seriously interested in that growth. Various histories, more or less complete, have been written touching on the several phases, but we have had no reference library to instruct us in the development of the different mining properties, save a quiet retreat to one of the old pioneers. This led me to compose the chief features in the development for my private use. It seemed to me that a graphic presentation further assisted to clear up the uncertainty of dates and figures, and in the hopes that it may be interesting to a portion of the Journal's readers, I venture to submit for this their use. The properties given produce about 85% of the camp's output, and I have included in the chart only the chief producers to prevent confusion.



Thetford Mines.

In the years 1875 Fecteau first observed asbestos, while roaming through the forest where Thetford Mines now stands, on a hunting excursion. Mr. R. Ward, of Ward Brothers, also discovered some outcroppings of asbestos while hunting for a mill-site on the Thetford River during the same year. The Q. C. Railway survey party passing over the present site of Thetford during the summer of 1876 saw several outcrops, which several events created interest, but led to no growth in the industry.

The Boston Packing Company, two of its directors being Col. Hutchins and Mr. Hayden, had noted recent discoveries which had been made in Pennsylvania, and thought it likely that other and more valuable discoveries might be made, advertised as early as 1874 in Boston papers.

In 1876 M. Nolan visited the vicinity of Thetford Mines to attend a wedding and carried back with him a sample of the curious material, which he afterwards showed to Mr. Hatch of Montreal.

Ward brothers, Alfred and Robert, sons of Church of England clergyman at Lower Ireland, purchased from the government in 1876 the first asbestos property, securing same through Crown grant, entailing cost of 40 cents per acre and settling duties for four years. Their purchase covered lot 27 in the V range of Thetford.

In 1877 A. S. Johnson, of Inverness, purchased lot 27 in the VI. range of Thetford, and also 29, 30, and 31 in Range B., Coleraine, on conditions mentioned above.

In the summer of 1877 Mr. Johnston shipped about 200 lbs. sample to Philadelphia with a view to testing the value of the discovery and of working up a possible trade. The goods were favourably received and a shipment was made in May, 1878, by Ward Bros., and followed by a shipment from Johnson's property in September of the same year.

Ward Bros. now bonded their property to Mr. Hatch, of Montreal, for $6,000, $25 down, but the option was dropped. Again in 1878 Mr. Goff approached Mr. Thomas with a view to getting the Boston Asbestos Packing Co. interested in the Ward property. Mr. Thomas "went by" Mr. Goff and secured for the B. A. P. Co. the south-west half of Ward's for $6,000. The B. A. P. Co. worked their half for a time, but noting that their half was not as good as the north-east half, took legal proceedings to gain possession of the better half, and succeeded in forcing Ward Bros. to make the exchange. Ward Bros. worked along for another seven years when they got into a lawsuit with the Q. C. Railway over blockading their tracks, and, losing the suit, the property was so much entailed that they gave it up after which it lay idle from then till 1911 when it was again re-opened by the Martin-Bennett Asbestos Co., at a purchase price of $710,000.

The Boston Asbestos Packing Co. worked the other half of this property till 1886, when it was sold to John Bell & Son, asbestos manufacturers of London, England, which company was re-organized to take over the asbestos mining end of their business under the name of the Bell Asbestos Co., in 1888, which company re-

tained ownership till 1903, when it was taken over by the manufacturing company of Keasby & Mattison, of Ambler, Pa., the mines working under the name of the Bell Asbestos Mines Co.

In 1878 Mr. Murphy secured from the Crown the reduced lot 28 in VI. Range, which he worked till 1892, and then let lie idle till it was taken over by Wilson Patterson, of Montreal, and formed under the title of Thetford Asbestos Co. in 1889. This company did not do much and the property again remained idle till 1909, when it was purchased through Walter Raleigh Kerr for the Jacobs' Asbestos Co. In the same year, 1878, Mr. Goff purchased from the government lots 31 and 32, Range C., Coleraine, which he exchanged with Mr. Wells for some property in the United States. Wells sold his property and half was secured by Messrs Lucke and Mitchell, Sherbrooke, and a quarter each by Mr. R. H. Martin & Co., and J. J. Williams, in 1886. This property lay idle from 1892-96, when it was re-organized as the Beaver Asbestos Co., and became a part of the Amalgamated Asbestos Corporation in 1909, which concern was re-organized into the Asbestos Corporation of Canada in 1912.

King Bros., lumber merchants, secured by Crown grant everything in the V. Range, Thetford, except Wards'. In 1881 they obtained from the government lot 26 in the VI. Range, and worked this asbestos property till it was formed as the chief producing unit of the Amalgamated.

In 1878 Dr. Reed raised an agitation with the goverment which resulted in all the asbestos properties which had been issued by Crown grant to be cancelled and offered by public sale. The lands realized from $1 to $10 per acre, and by this manoeuvring Dr. Reed secured his holdings. He also obtained the Ogden block, located near Robertson, through purchase of what had been a military grant. His holdings were in all about four thousand acres.

It will be noted that all the present Thetford asbestos properties were discovered between the years 1876 and 1882.

Black Lake.

Glover & Fry, of Quebec, secured Block A. by Crown grant from the government previous to 1870. There was some dispute about the lines and an engineer, Poudrier, was engaged to re-survey the property which resulted in dividing same into Block A and Block B. Block A was secured by Larochelle in 1876, Larochelle being at the time a contractor on the Kenebec Railway, which operated from Levis to St. Joseph in Beauce. Larochelle borrowed money from a local bank and the property thereby came into the hands of Papaineau and Chapleau in 1880. In 1881 they sold a portion to Chas. Lionais, which was formed into the Anglo-Canadian in 1885. Frechette & Douville also purchased a part in 1881, which they worked till 1889 and then sold to the United Asbestos Co. in 1889. Lionais bought another part in 1883, which was purchased by the Scottish-Canadian in 1887. The Anglo-Canadian was re-formed into the Standard Asbestos Co. in 1897 and made part of the Amalgamated in 1909, and the Asbestos Corporation in 1912. The United Asbestos Co. was purchased by Mr. H. M. Whitney, of the American Asbestos Co., in 1906, after lying idle a good deal for several years, and combined with the British-Canadian in 1908, became the beginning of the Amalgamated in 1909, and also part of the Asbestos Coporation in 1912. The Scottish-Canadian was sold to the Glasgow & Montreal in 1894, and like the Limited was idle the greater part of the time till taken over by the American in 1906 to form the British-Canadian in 1908, and move en bloc into the Amalgamated and later into the Asbestos Corporation.

North-east half lots 27 and 28 were secured from the government (Range B. Coleraine) in 1878 by Reed & Hayden, and was worked little till secured by the Bell Asbestos Co., on its organization in 1888, after which it was idle most of the time till incorporated into the Black Lake Consolidated in 1909. South-west half of the same lots were held from the government by Dr. Reed in 1878, and formed by Louis Wertheim, of Frankfurt, into the American Asbestos Co., in 1888. This concern went into liquidation, and in 1897 was reorganized as the Union Asbestos Mines and purchased by the Consolidated Asbestos in 1909.

Murphy purchased lots 31 and 31 R. C. in 1878 which worked for a time, but was mostly idle till purchased by H. M. Whitney and formed into the American Asbestos Co. in 1901. This was reorganized as the British-Canadian in 1908, and into the Amalgamated in 1909, and Asbestos Corporation in 1912.

Johnson's Co. purchased lots 29, 30, and 31, Range B. Coleraine, which has always been under the same ownership.

Danville.

Mr. Webb owned as farming lands lots 8 and 9 Range III. Shipton, which were purchased by Mr. Jeffrey in 1879, sold to Boas & Greenshield in 1893, and formed into Slate and Asbestos Co., and in 1897 incorporated into the Asbestos & Asbestic Co.

MINING DEVELOPMENTS IN WESTERN AUSTRALIA.

(Exclusive Correspondence of Canadian Mining Journal.)

London, October 3rd, 1912.

Western Australia, although still having only a trifling population for its enormous area, is developing rapidly. In 1890 the population was only just over 46,000; last year it had advanced to almost 300,000. In the same period the government revenue increased from $2,070,000 to $19,250,000. The external trade increased in the same period from $7,731,300 to $83,140,635. The great boosting factor has, of course, been the mining industry, and principally gold mining. Altogether over $515,000,000 worth of gold has been produced by Western Australia and the production goes on.

In the last five years of last century the effects, first of the Coolgardie and secondly of the Kalgoorlie discoveries, sent the gold mining industry rapidly ahead, and in those years the annual output rose by leaps and bounds from about 200,000 ounces to over a million ounces. This rapid rate of increase was maintained until 1903, when the gold output of the state reached the record of 2,064,801 ounces, of the value of $43,853,595. Since the zenith year of 1903 the gold output year by year has shown a gradual shrinkage, until for 1911 the figures were: Output, 1,370,868 ounces, value, $29,115,375.

The East Coolgardie Field, which practically means the Golden Mile, easily retained last year its place as the largest gold producer in the state. Out of the total output of 1,370,868 ounces, this field accounted for 809,547 ounces, or 59 per cent. of the whole, a higher percentage than it has ever yet shown. The East Coolgardie output, moreover, as compared with that of 1910, showed a shortage of 26,727 ounces, a percentage falling off of only 3.2 per cent. The total yield from fields other than East Coolgardie, last year was 561,321 ounces, and that was a decline from 1910 of 73,037 ounces. With one or two comparatively unimportant exceptions, every goldfield in Western Australia showed a less output for 1911 than for 1910. In most instances, however, the shortage was fairly insignificant; only in two or three cases was it serious.

An important development of the year has been the location by diamond drill in the Golden Horseshoe mine of a lode 15 feet wide, assaying 30 pennyweights to the ton (2,240 pounds). This drilling was done from the Great Boulder main shaft. Subsequently another drill hole was bored from the Great Boulder "Edwards" shaft, and located what is believed to be the same lode, but with a width of 27 feet, assaying 18 pennyweights per ton.

The Dundas field deserves notice as having been virtually the only one to show an increased output last year, 48,361 ounces, as compared with 43,261 ounces in 1910. The main producer on the Dundas field last year was the Mararoa, which turned out gold to the value of over $350,000, and paid $100,000 in dividends, besides accomplishing a great deal of useful development work. Other Dundas mines that have developed well and give good promise for the future are the Surprise and Viking No. 1. The latter has obtained some very rich returns.

The East Murchison field showed last year by far the largest shortage of output, having produced only 96,455 ounces, as compared with 138,748 ounces in 1910. This large deficit of 42,494 ounces, which accounts for nearly half the total falling off in the output of the state, was due mainly to the closing down of the Vivian and Gwalia Consolidated mines and to a big drop in the production of the Black Range and Oroya Black Range mines.

Although the Murchison field shows a slight falling off of output—123,365 ounces as against 130,983 ounces in 1910—there is no cause for disquiet about its prospects which are really very good. The big mine at Day Dawn, the Great Fingall, is developing satisfactorily at depth, while the Fenian, the Ingliston Consols, the Ingliston Extended and the Commodore give promise of becoming large producers.

A revival is probable on the North Coolgardie field, which produced 60,270 ounces last year, and did not fall far short of the previous year's output of 60,887 ounces. The chief mine of this field, the Menzies Consolidated, maintained its yield well during the year.

Looking at the gold mining industry as a whole it must be admitted that from the standpoint of statistics the result of last year's work was somewhat disappointing. As a set-off, however, the industry laboured under two disabilities, which, it is to be hoped, may prove to have been exceptional; the first was the shortage of labour, which hindered mining operations in the outback districts; and the second was the shortage of water, the result of two years' drought, which was severely felt in the outside districts. Given the removal of these two retarding influences—and in the natural course of events their removal is at least probable—the outlook is distinctly hopeful.

The copper mining is a factor of growing importance. The world's total production of copper last year was 869,370 tons (of 2,240 pounds), of which Australia generally contributed 44,660 tons, or just over 5 per cent. Copper (and lead) mines were discovered in Western Australia in 1842, but working was carried on in a most perfunctory manner in the early days. Rich lodes of copper have been located at Whim Creek, in the Pilbarra district of North-Western Australia, about 50 miles eastward of Roeburne, the copper ore being removed by quarrying. Promising lodes have also been struck elsewhere, such as at the Irwin mines and in the Kimberley district, which is intersected in places by copper and lead deposits in association with gold, and a rich lode has been located at Mount Barren, whilst various quartz reefs in the Wougan Hill contain copper in association with gold. Other fields are, of course, also producing this mineral. French and English capital are both engaged in developing Western Australian copper and much money is being spent on development work and equipment.

Tin is also mined in Western Australia, the bulk of it being derived from the Greenbushes field, where an interesting change in mining methods has occurred during the past four years, the alluvial miner having entirely given place to suction dredges. There are now stated to be about twelve plants in operation, varying in size from 12-inch nozzle pumps on floating dredges to 6-inch pumps driven by a small gas producer plant and portable steam engines.

In 1907 the Westralian output of tin was valued at $830,000, but in 1910 it had fallen to $230,000. Last year's production was worth about $275,000, so that the improvement that has taken place in the tin market since the heavy fall in 1907 has not been reflected by an equal increase in the output of the metal from Western Australia.

Regarding the Pilbarra tin fields, it is stated that Moolyella, which in 1907 was the largest producer of tin in the state, has practically died out entirely, and operations in connection with testing for dredgings plant on the Cooglegong Creek have been unsuccessful. Against this there has been a steady output from the Wodgina district, and it is reported that considerable lodes have been struck on one property in this district, with the result that some interest has been shown by people interested in tin in the Federated Malay States.

It is evident that the high price of tin no longer attracts the working prospector or miner, and that if the extensive field that exists in the West Pilbarra district is to be properly exploited it will have to be worked by capitalists and probably by means of dredging, provided sufficient water can be conserved.

GOLD MINING IN ONTARIO.

(Written for the Canadian Mining Journal.)

There lay in the vault of one of the city banks the other day, a couple of gold bars valued at $35,000, the product of the Hollinger mine. On the Rand or in one of the great gold mines of Australia or the Western States, the bars would have excited no more comment than a shipment of silver bars from Cobalt, yet on the floor of the bank vault in Toronto, to an enthusiast in Ontario gold mines, the bricks were a prophecy, an earnest of mighty things yet to be.

So far the business of gold mining in this Province has afforded more room for the exercise of hope than for the pleasures of realization. Not that there is no gold in Ontario. Indeed, there are probably few places of similar extent where it is more widely distributed. In the counties north of the east end of Lake Ontario; on the north shore of Lake Huron; on the eastern, northern and north-western banks of Lake Superior; on Rainy River; Seine River, and Lake of the Woods; on Larder Lake, Lake Wahnapitae, and Lake Abitibi; at Porcupine, Shining Tree, Swastika, and many other places, has the shining metal been found, sometimes as colors in the pan and sometimes as nuggets in the quartz.

Half a dozen times has it seemed that the gold mining industry had really arrived, and that at last the end of the rainbow had yielded up its prize.

Nearly fifty years ago the rufflers in the rush at Madoc had to be restrained by the mounted police of the day from invading the precincts of the Richardson chamber to prove whether or not its reputed riches were really there. No other pockets of a like kind were unearthed, but the prospectors of those and later days, showed that gold in the county of Hastings was not a myth, and it may well be that the quartz veins of Cordova and the auriferous mispickel ores of the region will yet make not the least considerable contribution to the gold output of the Province.

Lake of the Woods had its Sultana, its Mikado, its Regina, and its other deposits named after Oriental potentates. Once the Sultana seemed about to prove a bonanza, and indeed from first to last it yielded a good deal of gold. The Mikado, too, was not only rich at the grass roots, but carried values well down into the mine. Its productiveness led Colonel Engledue and his English associates, to undertake extensive and systematic operations in the hope of uncovering like bodies, but only the Elizabeth was found, and presently the Mikado vein ran into lean ground and activity was succeeded by silence.

The Golden Star, the Olive, Foley and their contemporaries, served in 1897 and 1898 to bring the Seine River into relief and Mine Centre into existence, but protogine bands, Hammond Reefs and Sawbills alike failed to produce in quantity, and once more there was quietness.

Sir Henry Clement Wilkinson, British general and Christian soldier, looked for "ounce rock" in the Regina, but found instead that the process of putting more money into a shaft than comes out of it cannot go on forever. The Ophir mine in Galbraith township, the Shakespeare mine at Webbwood, the Crystal at Lake Wahnapitae, the prospects in Davis, Kelly, Scadding and Rathbun, the Creighton gold mine, the big quartz dikes at Rossport, the numerous showings at Sturgeon Lake, all raised expectations that were doomed to disappointment. Practically nothing but the St. Anthony at Sturgeon came out of it all. Even the placers reported from the Vermilion Valley failed to show spots rich enough to warrant the working.

Later still, the pellucid waters of Lake Erie were alleged by clergymen, bankers, and other mining experts, to contain gold in abundance in the sandbanks covered by their waves. An old Californian miner had found it, and only a fatuous government refused them the privilege of taking it out. At the end of a long tale of disappointment one might fairly ask, What is the matter. Is there no gold in Ontario? No paystreaks there?

Beyond doubt much of the failure was due to inexperience and lack of skill, much to the choice of unlikely locations, partly also to too great a hurry for dividends, and partly to downright dishonesty and stock-jobbing. Stamp mills were run up and equipped before it had even been shown that the mine contained ore enough to keep them running. Sometimes the value of ore decreased with depth, sometimes the vein pinched, sometimes it faulted, sometimes it split, sometimes there never was any. The record is discouraging enough, sufficiently so to put a check upon sanguineness when a new gold field is discovered.

Yet it is a long lane that has no turning. The prospects at Porcupine will not all prove to be mines, but some of them will. The Hollinger and Dome are mines now, and there are others not so large whose outlook is more than promising. The field was opened under auspicious circumstances in that the two principal deposits fell into strong hands, capable of proving them without recourse to the stock market, and that are still in control. Diamond drill bores promise richness in depth, and the situation is full of hope. It must be remembered, however, that there are as yet no deep shafts in Porcupine, and until much lower levels are reached it cannot be held that uncertainty is wholly removed. The gold output for this year, however, will be the largest in the history of Ontario, and 1913 and succeeding years should see many millions of Porcupine gold in circulation.

KINGSTON SCHOOL OF MINING.

New Mining and Metallurgy Building and Research Laboratories.

(Written for The Canadian Mining Journal.)

The School of Mining at Kingston, affiliated with Queen's University, formally opened its new Mining and Metallurgy Building on Wednesday, Oct. 16th. This building is the most modern of its kind and has been laid out so that mining and metallurgy may be presented to the students in the light of the most recent developments.

By the erection of this building, not only has the School of Mining assured herself one of the foremost places in the training of young men for mining and metallurgical engineering, but, as well, she will continue even more than ever to be a pioneer in the development of these sciences. The building has been laid out to make possible a wide variety of metallurgical research work.

One of the greatest sources of Canada's tremendous natural wealth is her mineral deposits. In Ontario alone are to be found the metals gold, silver, copper, nickel, cobalt, iron, lead and zinc, and a great variety of non-metallic substances. Canada supplies 70% of the nickel, and 15% of the silver for the world, and is practically the sole producer of cobalt. The development of these vast resources, so that humanity may at present benefit by them, and yet, so that posterity may not have cause to complain of undue wastefulness or extravagance, is one of the great problems of the day.

Proper development in these respects requires not only that new ways be found to increase the efficiency of production and the economy of utilization of the materials which are at present in use, but it requires that uses be found for the by-products of these processes of production, and for the great quantities of material which at present are being temporarily set aside in the rush for the obviously valuable. There is an ever increasing work to be done by the industrial scientist to keep the industries apace with the rapidly spreading boundary of scientific discovery.

This work is being done in part at the research laboratories of the various industries concerned. But, the largest problems, those which involve the welfare of every citizen, are often unsuccessfully undertaken, or not undertaken at all, by those in charge of these industries. For example, a large percentage of the zinc which goes into the melts in the process of the manufacture of brass, is volatilized, and passes through the flues, never to be recovered. This is not a loss to the manufacturer, but to the general public, who pay millions of dollars for this zinc in the increased price of brass. No individual concern has successfully found a way of avoiding this loss, nor has any concern a sufficiently large interest to warrant the expenditure of the money, the energy, and the time, which the solution of this problem would require. It is clearly the peoples' problem, and the investigation is now well under way for the United States Bureau of Mines at the Electro-chemical Laboratories of Cornell University. This is but a single instance among many.

Similarly the Canadian Government has undertaken to help in the solution of some of the numerous industrial problems which affect the Canadian people. Some of this work is being done at the Government Bureaus, and some is being done by the universities. Much of it can best be done by the co-operation of these two. Not only is it a function of the University to lend its laboratories and its professors to this sort of work, but it is its duty to train some of its students, having the necessary enthusiasm, so that they may have the scientific knowledge and the breadth of view to carry on researches of this type. The increasing demand for scientific investigation cannot fail to bring about greater co-operation between government and university in the future, which will affect them in all their relations.

With these facts in mind, the School of Mining has very wisely laid out a suitable portion of its new mining and metallurgy building for the establishment of a research department of metallurgy and applied electro-chemistry. This department has been in active operation since April of this year under the direction of Dr. H. T. Kalmus.

With the water power and coal situation as it is, the natural trend of development of many of the Canadian metallurgical industries will be through increased utilization of electric power. Hence this new research department has installed very complete electrical equipment. The power plant of the School of Mining has been enlarged for the purpose, and will soon be able to supply 120 kilowatts at 2200 volts to this laboratory. Suitable transformers, bus-bars, switchboards, etc., are installed so that electric furnaces may be operated at any current up to 3000 amperes, and at varying voltages up to 120 volts. This power equipment, with the most modern auxiliary apparatus, provides as complete an electro-metallurgical laboratory as is to be found anywhere in the world.

The first investigation, which is now well under way, and which is undertaken for the Mines Branch, Department of Mines, Ottawa, has to do with the utilization of the metal cobalt. Canada has produced, and is producing, millions of dollars worth of cobalt, of which only about one-third finds its way into the industries. Although this metal is in many respects similar to nickel, no important alloys of it with other metals are in use. An exhaustive series of researches is therefore being undertaken for the government on "The Metal Cobalt and its Alloys," for the purpose of increasing its usefulness in the industries.

No mention of this new mining and metallurgical department at Queen's would be satisfactory without noting that it was made possible by the magnificent munificence of Queen's own graduates. The building is called Nicol Hall after Prof. Nicol, whose extreme generosity made its erection possible, and it will stand as a lasting monument to him and to the large number of graduates whose gifts supplemented his.

THE JASPER PARK COLLIERIES.

Much interest is being taken in the development now taking place of an important coal area, on the line of the Grand Trunk Railway, some two hundred miles to the west of Edmonton. Of the several new collieries being established in this field, the Jasper Park is important. We are indebted to Mr. R. H. Morris, general manager of the undertaking, for the following account of the property and of the development operations to date:

The property of the Jasper Park Collieries, Limited, are situated at Pocahontas, Alberta, 208 miles west of

General View Jasper Collieries

Edmonton, and comprise four claims of 2,560 acres each, in all 10,240 acres. These claims extend on either side of the Athabaska River, and cover an area eight miles long, and two miles wide. The Grand Trunk Pacific Railway crosses the property on the south side of the river, while the Canadian Northern are now building their line on the north side of the river through the property.

Development work was begun on the south property in May, 1910; at this time the steel of the Grand Trunk Pacific Railway was at Wolf Creek, about 90 miles from the property. The first work consisted of prospecting, in building cabins as quarters for the men, in building trails and roads. The seams which were exposed about four miles south of the river were traced down near the line of the railroad.

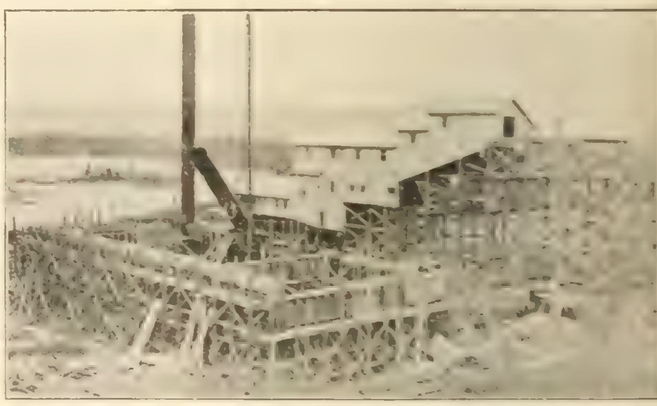
Work was then commenced on one of the seams at a point about 275 feet above the railway. This seam pitches from 50 to 56 degrees to the south-west, the line of the strike being S. 55 deg. E., and at about right angles to the line of the railroad.

A tunnel was driven on the outcrop of the seam which was partly in gravel, and partly in coal; the coal outcrop being covered from 16 to 25 feet with gravel in the first few hundred feet of the tunnel. At a point about 1,000 feet from the mouth of the tunnel an air shaft was sunk on the coal at a depth of forty feet, to the floor of the tunnel. Two hundred and twenty-five feet south from this shaft another was sunk on the coal, (about 18 feet when prospecting the seam), and when the tunnel reached this point, a connection was made to this shaft on the coal, the depth being sixty feet. From this shaft, a counter gangway was started and after leaving sufficient pillar to protect the shaft, rooms were started.

In the early development, the main difficulty was that of getting in supplies, all of which had to be freighted from Wolf Creek and Edson, a distance of 90 miles, over very poor roads. The steel on the Grand Trunk Pacific Railway was laid past the camp on June 17th, 1911.

The tunnel on the coal being 275 feet above the railway necessitated the installation of a hoisting plant, and a 30 h.p. friction drum two-motion American Hoist and Derrick Co. engine, and a 60 h.p. return tubular boiler, were installed. A tipple, wide enough to accommodate two tracks 36 inch guage was built of poles, and a home-made dump provided. The distance from the engine to the tipple is 1,200 feet on the incline, which varies from 13 to 28 degrees. The track on the tipple, incline, and in the mine, was laid with 16 lb. rail. Five-ton Fairbanks scales were installed on the tipple to weigh the coal in the mine cars, which are 1½-ton capacity, two cars being lowered in a trip. Connection to the main line of the railroad was made September 1st, 1911, by a siding 2,000 feet long, connected at both ends to the main line. The first car of coal was loaded on September 21, 1911. The present output is about 10,000 tons per month, and to date, over 85,000 tons have been loaded over the temporary plant. The Grand Trunk Pacific Railway has taken this entire output for locomotive use.

In order to increase the output it became necessary to instal a permanent plant of greater capacity, and accordingly a contract was let to the Roberts & Schaefer Co., of Chicago, Ill., for a complete and modern equipment of 2,000 tons daily capacity. Work has proceeded rapidly on the contract during the summer, and it is expected that in the course of the next few weeks the entire new equipment will be in operation. The plant consists of tipple, power plant, supply house



Reinforced Concrete Foundations of Power House

and shops, all of which are located on the flat near the main line of the railroad.

Since there is a considerable depth of gravel, sand and clay overlying the coal seam on the face of the hill, a slope was sunk on the coal seam to what is the main tunnel 232 feet below the level of the upper tunnel. The mouth of this slope is about 1,500 feet from the face of the hill. From the foot of the slope the main tunnel on the coal was started and was driven 500 feet towards the face of the hill when the gravel wash was encountered.

Shortly after the main tunnel was started from the foot of the slope the line was projected to the face of the hill, and driving was begun to meet the tunnel

driving from the inside. The work progressed very favourably until a layer of quicksand and boulders was encountered. This occasioned much trouble, but on passing through the layer solid clay was reached, and it is anticipated that the connection will be made very shortly. Simultaneously with the driving of this connection, the main entry south with the necessary aircourses has been driven. When connected, 400 feet of gravel clay and sand will have been driven through in making the lower tunnel. The material from the slope has been handled by a 20 h.p. friction drum, two-motion, American Hoist and Derrick Co. engine, and a 30 h.p. internally fired boiler.

View of Tipple

The tipple is a wooden structure, connected to the side of the hill by a wooden trestle, thence to the tunnel mouth by making a cut in the side hill. The tipple is equipped with a Phillip's cross-over dump. The coal from the dump goes to the feeder thence on to shaking screens of $1\frac{1}{2}$-inch perforations. From the screens the coal goes to picking tables, the fine coal being deposited on the bottom of the tables, and the lump on top of the fine coal, which greatly facilitates picking. From the picking tables the coal is loaded into either box cars or gondolas, by adjusting the chutes. One 5-foot picking table is now being installed, but provision is made for the installation of another table for future requirements. These tables are the Roberts & Schaefer Co. design, and have a capacity of 200 tons per hour.

The loaded cars are fed on to the dump by a car feeder and are weighed over a 7-ton Fairbanks automatic dial scale. The empty cars after passing over the dump back switch to an empty car haul which elevates them. They are made up into trips by gravity. The tipple machinery is made by the Webster Manufacturing Co., of Tiffin, Ohio, after the design of the Roberts & Schaefer Co. The tipple machinery is driven by Westinghouse induction motors of 440 volts, 3 phase, 60 cycle, alternating current. A Christy portable box car loader is being installed, and is equipped with a 50 h.p. induction motor 440 volts. The railway cars will be handled through the tipple by a Fairmount car retarder. The tipple is sided with corrugated iron siding, and the roof is covered with asbestos roofing. The pickling table room is ceiled, has a double floor, and is heated by exhaust steam from the power plant, which also heats other parts of the tipple where necessary.

The power plant building is of reinforced concrete, the roof being covered with asbestos roofing. The building is 114 feet long by 45 feet wide, and has a solid wall partition separating the boilers from the engines and dynamos. In the boiler room four 150 h.p. 150 lb. pressure return tubular boilers, furnished by E. Leonard & Sons, have been installed. The boilers are set in batteries of two, and there is space in the boiler room for two additional boilers. In the boiler room are also the necessary pumps and heater. Coal is taken from the tipple screenings by means of two conveyors, which deposit the coal for boiler use in bins in front of the boilers. In the power room one 150 k.w. and one 50 k.w. 440 volt, 3-phase, 60-cycle, alternating current generators have been installed. These are made by the Electric Machinery Co., of Minneapolis, Minn. The 150 k.w. generator furnishes power to operate the necessary machinery of the plant, and the 50 k.w. generator is used for lighting and driving the fan at night. There is space in the power room for an additional unit to be installed. The supply house is a wooden structure 30x60 feet, with corrugated iron siding and asbestos roofing; ceiled on the inside with an office for the supply man, also the necessary racks. This building is located near the supply track and is convenient for unloading from the railroad cars. The shop building is a wooden structure, 30x90 feet, corrugated iron siding, asbestos roofing and ceiled on the inside. In this building are the machine, carpenter, and blacksmith shops. The shops are equipped with the necessary tools and machines, with a line shaft extending the entire length of the building which is driven by a 15 h.p. induction motor. The shop building is situated near the mouth of the tunnel and has a track extending the entire length inside the building, being connected to the main haulage road, making it convenient for taking in cars or locomotives for repairs. The greater part of the timber used in the plant has been sawed on the company's timber limit, which lies on the north side of the river. The lumber is sawed by contract, and brought down the river by raft.

The railway tracks will accommodate 60 empty cars above the tipple, and 60 loaded cars below the tipple. A Fairbanks 44 foot 60-ton empty car track scale is being installed above the tipple, and also a 44-foot 100-ton loaded car track scale is being installed below the tipple.

Ventilation for the mine is now being furnished by a six foot Sheldon fan, steam driven. A 15 h.p. induction motor is, however, being connected to the fan, which thus may be either steam or electrically driven.

Mining.

The seam now being worked has an average width of 8 feet and pitches from 50 to 56 degrees. The seam is clean, except for a small parting near the centre which varies from one inch to six inches in thickness. The mining is carried up the pitch in 15-foot breasts, 55 feet centres. The hanging wall and foot wall are of sandstone, with an occasional layer of shale adjacent to the rock. Where this shale occurs the coal parts very freely, as it also does from the sandstone. In drawing pillars the roof breaks freely, and a large recovery of coal is obtained. The upper tunnel is now in 3,700 feet, and has a lift of 300 feet above the tunnel which increases as work on the seam progresses. At present the coal is hauled by horses, and as it is expected to retain this mode of hauling for probably the next six months, permanent mechanical haulage has not been decided upon. Meanwhile the various types of haulage are being investigated, and special enquiry made concerning the storage battery locomotive. Wolf safety lamps are used in all the workings in coal, notwithstanding the fact that the mine gives

off very little gas. Monabel powder is used exclusively and electric batteries are employed in firing all shots.

There are two other seams to the west of the seam now being worked. The first is approximately 350 feet west of this seam, and from the outcrop showing is nine feet in thickness of clean coal. The other is 700 feet to the west of this seam, and shows twelve feet in thickness. These seams lie parallel to the seam now being worked, and pitch about the same angle. It is proposed to cross-cut to these seams from the tunnel of the present seam and bring all coal to the one plant. Approximately one mile to the east these seams are duplicated.

The coal is the bituminous coal of the Kootenay series. In the seam now being worked, the lower half of the seam is soft and mines in small flakes, while the upper part is harder, and mines more lumpy. In the lower tunnel, however, the lower part of the seam becomes harder. The following are analyses of coal obtained from a channeled sample across the seam from the two trenches:

	Top of Seam.	Bottom of Seam.
Moisture.	30	50
Volatile combustible ..	17.88	17.26
Fixed carbon	74.53	76.33
Ash.	6.32	5.20
B. T. U.	14974	14650
Sulphur.	97	71

This coal is an excellent steam coal, and by practical locomotive tests made by the Grand Trunk Pacific Railway, has equalled that of the best Pittsburgh coal. Tests that have been made of this coal show it to be a very good coking coal.

The town is called Pocahontas and derives its name from the fact that the analysis and character of the coal is very similar to that of the famous steam coal of West Virginia.

The company has now built twenty three-room cottages and seventeen four-roomed cottages, one twelve-room boarding house and a school house accommodating 50 to 60 pupils, and twenty more four-roomed cottages are now in course of construction. These houses are now being wired for electric lighting. The houses are well built, and make very comfortable homes for the men and their families.

A waterworks system is now being installed, the water coming from several springs about 1,000 feet from the houses. A well is being sunk at these springs, and as they do not freeze a constant supply of pure water is assured. A centrifugal pump, electrically driven, is being installed at this well, the water being piped through a 6-inch wooden pipe to a 20,000 gallon wood tank. The lateral pipes from the main are 4-inch in diameter, this pipe is buried 6 ft. 6 in. below the surface, and is well below the frost line.

The water supply from the town is carried down to the lower camp and thence to the plant, which not only supplies pure water, but affords a good fire protection.

A well equipped hospital is maintained, with a physician in charge, assisted by an experienced nurse.

The permanent plant is expected to be in operation about November 1, and by early spring a daily output of 1,000 tons is assured.

THE SEMI-ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE.

The recent meeting of the Institute at Victoria and Frank was in the nature of an experiment. It is necessary that the big meeting of the year—the Annual meeting in March—should be held in the East. From attending this meeting Western members are debarred by reason of distance. They miss, therefore, one of the main privileges of membership, for the annual meeting is an event always pleasureably anticipated by those who are in a position to attend it. Moreover, Western opinion on important questions affecting either the industry or the Institute's policy cannot be voiced. Hence the project of holding semi-annual meetings in the West. The selection of Victoria for the first of the series was, perhaps, a mistake. Victoria has no longer concern in mining, being entirely absorbed in the matter of real estate speculation. In consequence the local attendance was relatively small. But if small it was select; enthusiasm compensated for lack of numbers; and the warm welcome and kind hospitality extended to the visiting members by the Premier and Minister of Mines, Sir Richard McBride; by the Hon. William Templeman, Mr. J. J. Shallcross (President of the Board of Trade), and others, was a very pleasant feature of the occasion. Some twenty members of the Western branch, including Mr. M. E. Purcell, Chairman, and Mr. E. Jacobs, Secretary, were in attendance at the Victoria meeting; and it is but fair to mention here that the success of the meeting was very largely due to Mr. Jacobs' efforts. The visiting members included the President of the Institute, Dr. A. E. Barlow, who presided; Mr. R. W. Brock, Director of the Geological Survey; Mr. D. B. Dowling, Mr. C. Camsell, Mr. J. G. S. Dudson, Mr. O. E. LeRoy, Mr. C. H. Clapp, Mr. W. H. Boyd, Mr. L. O. Armstrong, and the Secretary of the Institute.

In Victoria, three sessions were held on Thursday, September 18th, and one session on the following day. On the Friday evening the Institute and its Western branch, acting as joint hosts entertained Mr. Templeman, Mr. Shallcross and other gentlemen at a dinner given in their honour at the Empress Hotel. The meeting was then adjourned until September [illegible], on which date two sessions were held at Frank, Alta. The meeting here was eminently successful, and, as already reported in our last issue, resulted in the organization and establishment of a branch representative of the coal mining interests of Southern Alberta and South-eastern British Columbia. The arrangements for the Frank meeting were undertaken by a committee comprising Mr. J. T. Stirling, who acted as convener, and Messrs. O. E. S. Whiteside, W. D. L. Hardie, R. W. Coulthard, W. F. McNeill, and Lewis Stockett, to whom heartiest acknowledgments are due. On the whole, it may be considered that the experiment of holding an

annual meeting of the Institute in the West has justified itself, and there can be no doubt that it will be a regular provision in the future.

VICTORIA MEETING.

The proceedings at the morning session on September 18th were opened with an address of welcome by Sir Richard McBride. In view of the interest attaching to his remarks his speech is here presented practically in extenso. He said:

"I can quite understand the difficulties in the way of ensuring a very large and representative convention of your association at this season of the year. Many engineers are still in the field and those engaged at the mines can ill spare a week's time away from their work.

"Permit me now to extend to you on behalf of the Government and myself a hearty welcome to British Columbia—a province long notable for the wealth of its mining resources.

"Speaking for a moment on the subject of the Provincial Department of Mines, with which off and on I have been associated for upwards of eleven or twelve years, I feel from various acknowledgments received from mining engineers, from responsible commercial bodies in the province, as well as from companies operating here, and from the miners themselves, that the departmental policy has been productive of generally good result. We have in the last few years made a special attempt at the consolidation of the laws with regard to the operation of coal mines, and, with the assistance of our technical heads and permanent officials, we have, I think, passed an Act which not only protects the workmen and safeguards life and limb to an extent, perhaps, not so well covered heretofore by the regulations, but are at the same time giving fair recognition to the mining companies and the interests that they represent. Our Coal Mines Regulation Act, I may say, has been commended, not only at home, as I have just stated, but from States in the Union where coal mining is a prominent industry and from the Old Land complimentary references have been received. We do not assert that the legislation in itself is perfect or that it represents the last word in the way of mining regulation, but we do claim that it is immeasurably in advance of anything that has been attempted heretofore in any of the provinces of Canada.

"In connection with coal mining, it may also interest you to know that Mr. W. Fleet Robertson, the provincial mineralogist, has been for some time in the Groundhog coal basin. You are aware that very favourable reports and some very authoritative statements have been made by eminent mining engineers with regard to the coal deposits in that section. The government, in consequence, decided to send Mr. Robertson with a party to make a full and complete investigation of the conditions in this field.

"With reference to metalliferous mining, I merely remark that the mining industry in the Kootenay districts and elsewhere appears to be taking on new life. The operators and prospectors are working side by side and the Kootenay districts seem to be about to repeat the history of their early mining days in respect of mining exploitation and development. From the Slocan excellent accounts reach us as to the condition of affairs obtaining in the various mines, and it is common talk now that the Slocan district never looked better,—never was more promising than at present. From Rossland the news we got of well-known properties still operating there is most encouraging. In the Boundary, too, work is proceeding apace; smelters are busy, the larger mines are being operated at full capacity, and there is every reason to say that that section from a mining standpoint is prosperous. In the coast district, the Britannia mines, on Howe Sound, which have been in operation a number of years, are now making good returns from ore shipped, while the Granby Company has undertaken the work of developing mining properties at Granby Bay, Observation Inlet. There seems to be in sight, in connection with that property, the erection of another smelter in the province within the next two years. The property at Granby Bay is very valuable. It has already been well proved and the company has determined to develop at that point a large mining centre. Conditions at Portland Canal are rather quieter, although some work is proceeding there. In short, the mining industry of British Columbia is showing signs of prosperity on every side; conditions generally are improving, and there is every reason to anticipate prosperous times for the future. So far as the Provincial Government is concerned, if there is anything that we can do consistent with the public interest to assist in the expansion of the industry and in its wholesome growth and development, we are ready to move at once.

"Before I conclude my few words of welcome this morning, I think it is proper to observe that I am sure your Institute, in common with the Government, now that Western mining conditions are improving, is anxious to see that any company promotion that is attempted shall be along legitimate and right lines. There has been nothing in the industry in British Columbia so disastrous as that which occurred in the early days of lode mining fifteen or sixteen years ago, when scores of companies were promoted without the slightest possible justification. These worthless concerns were floated and the shares sold to innocent purchasers (strangers and foreigners to the country), with the result that the good name of British Columbia was injured to a most serious extent. I feel sure that your association, as well as the Government, will provide, as far as possible, against a recurrence of these conditions by insisting that promoters shall be most careful to move along right and proper lines.

"I may conclude with a reference to what is taking place to-day in Kamloops in the foregathering of our Pioneers to celebrate the early discovery of the Thompson and Fraser veins' goldfields. Time, of course, has thinned their ranks. Fifty years is a long time, and when we consider the hardships and the trials the pioneer gold seekers had to undergo while finding their way to the Cariboo goldfields, it is gratifying to know that so large a number of the original sixty-two are present in the City of Kamloops to-day.

"Before I take my seat I would like to say that you have in Mr. E. Jacobs, Secretary of your Western branch, a very energetic and active official. It has always been a great pleasure to me and those associated with me in the Provincial Department of Mines to work with Mr. Jacobs. We have invariably found him painstaking and anxious always to get at the truth of anything that has to do with mining in British Columbia, and ever ready to go the utmost pains to ensure the accuracy of his statements when he writes for publication. I cannot forget, too, that we have here our old friend Mr. H. Mortimer-Lamb, the secretary of your Institute, who some years ago was closely identified with mining in British Columbia. We have always followed Mr. Mortimer-Lamb's work since he left us, and we are glad to see the success he has achieved in his new field. While he is now resident some thousands of miles from British Columbia, it is fair to say that

whenever opportunity offers he is only too ready to say a good word for this province.

"I thank you very much for the opportunity you have given me to address you this morning, and I trust that your deliberations, like those that have characterized all the meetings of your organization, will be fruitful of excellent results."

At the invitation of the President, the Hon. William Templeman then addressed the meeting as follows:

"I esteem it a privilege to have the opportunity of saying a word or two to the members of the Canadian Mining Institute. I look upon your organization as one of the most important associations for the advancement of a particular industry that exists in Canada. During my regime, or my temporary occupation of the position of Minister of Mines for the Dominion of Canada, I had much to do with the Canadian Mining Institute. As you know, Mr. Chairman, you are very familiar, I think, with all the facts; the Department of Mines was organized only four or five years ago, and, during the organization of that department, the members of the Government and myself frequently sought the advice of the Mining Institute.

"During my term of office the question arose regarding the necessity of providing a mining law for the Dominion. The Institute unanimously recommended that steps be taken in this direction, and, after a conference with the Premier and myself and others, it was determined that a mining law for the Dominion of Canada should be prepared.

"The Act was prepared by a committee under the auspices or direction of the department. It was prepared by a committee of gentlemen representing very largely the Canadian Mining Institute, who, for months and months, studied the various provincial mining laws and those of the States of the American Union to complete a mining act that would be as nearly the last word in mining law and mining regulations as it was possible to have. I am quite sure that a mining law by the Dominion that would commend itself to the provinces would do a great deal towards accomplishing uniformity in mining laws throughout the Dominion—a thing much to be desired. So that, speaking of this, I deside to say that whatever has thus far been done towards preparing a law for the Dominion of Canada is due to the great interest, the intelligent interest taken in the subject by the Canadian Mining Institute. It is the great power behind the Mining Department at Ottawa at all events, and it is the power to which the department, during my time, looked for assistance and aid. and never looked in vain.

"It is to be hoped that the Institute will impress upon the Dominion Government the absolute necessity of completing the organization of the Department of Mines. It is most important to my mind that the Department of Mines should be made one of the leading departments of the Dominion Government. There is a strong feeling here that there should be a separate Minister of Mines. It would be a very excellent thing if we could have a separate portfolio of that kind, but we all realize that the Cabinet at Ottawa now includes some fourteen ministers, and the Premier might not deem it good policy to add another. Nevertheless, with whatever department that of mines is allied, it should not be subordinate to the other business of that department. For instance, just at the moment it is a branch of the Department of the Interior. That department is an enormous one. Any minister who attends to the duties of the Department of the Interior will have his hands full, regardless of mining matters. I am afraid the great importance of the Department of Mines will be lost sight of in such an enormous department as that of the Interior. If, therefore, it is not deemed expedient to create a separate portfolio, the Government might, at all events, reorganize matters in such a way that the Department of Mines would dominate the department to which it is attached. This is what really was intended under the first organization, because the Department of Inland Revenue, while very important in the sense of revenue, is less important, to my mind, in the development of Canada than is the Department of Mines."

The President, after thanking Mr. Templeman for his friendly references to the Institute, remarked that it was, of course a non-partisan body. This was fully realized, and he had no doubt that the present Government might be depended on to further the interest of the mining industry, and would unquestionably take the resolutions of the Institute into account.

Addresses were also made by Mr. J. Beckwith, Mayor of Victoria, and Mr. J. J. Shallcross, President of the Board of Trade. Some of Mr. Shallcross' remarks were particularly pertinent. To quote him in part:—

"One phase of the mining industry which appeals to me," he remarked, "is that it so enormously broadens the basis of prosperity. We know that in other countries they have had severe disasters because of one element only was the mainstay of the national life. Australia depended entirely upon the sheep industry, and a succession of droughts brought disaster. The same phenomenon was seen in Ireland, where they relied entirely on one crop—the potato. France depended on her vineyards, and when disaster overtook these vineyards, she was brought next door to ruin. In this country we have seemed to be rather too much dependent on one serial—wheat; and that might have put us in a position of great danger were it not for the development of other sources of wealth; but none of these other sources is so important as the mining industry. British Columbia's total mineral production is equivalent to one-third of the total mineral production of the whole of Canada. That is a very important factor, and one that contributes in a very great degree to the financial stability of this section of Canada.

"It is not only in the production of minerals that the mining men have shown their importance to the community, but they have spread the Dominion of Canada always farther and farther to the north. There would have been no Canadian Yukon if it were not for the mining men, and it is now proposed to establish a steamboat line, under control of a Canadian company, to establish communication eight hundred miles to the north and northwest of Dawson into the Fairbanks section of Alaska. This extension of territory is entirely due to the mineral industry. In the northerly section of Canada, the Mackenzie Basin, mining will, before long, promote settlement and prosperity. The production of gold and of other mineral wealth is sufficient to cause settlement anywhere, no matter how unfavorable the climate conditions.

"Our own mineral wealth, as it is developed and utilized, will be a continual inducement to [illegible] along other lines. We hope to establish here before long a large shipbuilding plant that will [illegible] the manufacture of iron and steel plates and other similar industries."

(To be continued.)

PERSONAL AND GENERAL

Mr. James McEvoy, mining engineer, Toronto, Ont., has returned from examining several mines in Eastern Quebec.

Mr. A. B. Willmott and Mr. J. W. Astley have completed an important examination in Eastern Ontario. Mr. S. N. Graham was also engaged in the same work.

Dr. Frank D. Adams was recently the guest of honour at a dinner given at Albany, N.Y., by Dr. John M. Clarke, the State geologist, to celebrate the dedication of the new State's Survey and Museum Building. Dr. Adams also represented McGill University at the dedicatory exercises.

Mr. William H. Nichols has been elected president of the Granby Mining, Smelting & Power Co., in succession to Mr. G. M. Luther.

Mr. J. M. Forbes, secretary of the Eastern Townships Branch of the Canadian Mining Institute, of Thetford Mines, is at present in Europe.

Mr. L. A. Bonner, manager of the West Canadian Deep Leads, Ltd., has been arrested at Barkerville, Cariboo district, B.C., on a charge of dynamiting and destroying parts of the ditches used to convey water for gravel-washing at the Lowhee placer-gold mine, near Barkerville.

Mr. Chas. A. Banks, formerly of Auckland, New Zealand, is now manager of the Jewel gold-quartz mine and stamp mill, at Long Lake, Boundary district, B.C., in succession to Mr. R. Roberts.

Mr. Chas. H. Clapp, of the Geological Survey of Canada, has closed his season's field operations in the southern part of Vancouver Island, and left British Columbia for Ottawa, going via Seattle, San Francisco, Salt Lake City, and Denver.

Mr. Geo. A. Clothier, for some years superintendent of the St. Eugene lead mine in East Kootenay, is now superintendent for the Indian Mines, Ltd., which is developing a promising mining property in the Portland Canal district, British Columbia.

Mr. James Cronin, of Spokane, Washington, has taken charge, as manager, of the Standard silver-lead mine, near Silverton, Slocan Lake, B.C., to relieve Mr. Geo. H. Aylard, general manager of the Standard Silver-Lead Mining Company, for a period of six months. This company has been paying a monthly dividend of 2½ cents a share on 2,000,000 shares, total $50,000 a month, since it made its first dividend payment of 1¼ cents a share in April last. Including the amount of the October dividend, $325,000 has been divided among shareholders.

Mr. C. P. Hill, of Montreal, president of the Hillcrest Coal and Coke Company, operating a coal mine near Frank, southwest Alberta, has been visiting the coast cities of British Columbia.

Mr. E. Jacobs, of Victoria, is visiting Kootenay and Boundary mining districts of British Columbia, obtaining information relative to the progress of mining in 1912, for use in his Annual Review of Mining in British Columbia for that year. He will be in Spokane, Washington, late in November, to attend the annual convention of the American Mining Congress.

Mr. G. C. Jaynes is now superintendent of the Surprise mine, in Slocan district of British Columbia, having succeeded Mr. F. E. Cummins who had charge of mining operations during the latter part of the time taken to do the difficult work of connecting, by means of an 800-ft. raise, a low-level adit with the old workings above.

Mr. H. E. Knobel, for some time engaged in directing the prospecting of mineral claims in Portland Canal district, B.C., is now connected with coal-mining property in Alberta. During October he paid a visit to Victoria, B.C.

Mr. R. G. McConnell, of the Geological Survey, left British Columbia about the middle of October, to return to Ottawa, after having spent the field-work season of this year on the Pacific coast.

Mr. Louis Pratt, formerly managing silver-lead mines in Slocan district, B.C., but during recent years with the P. Burns & Co. syndicate in connection with their mining interests, is in Europe.

Mr. Clive Pringle, of Ottawa, who is a member of the Retallack & Co. syndicate, owning the Whitewater group of mines, in Slocan district, British Columbia, recently paid a visit to that province.

Mr. A. B. Ritchie has returned to British Columbia after having spent a few months in Eastern Canada. He is now at the Consolidated Mining and Smelting Company's Molly Gibson mine, in Nelson mining division.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, recently proceeded to Nelson to be present at a demonstration by Mr. A. Gordon French in connection with the latter's claim that platinum metals occur in ore and dike matter in the vicinity of Nelson.

Mr. R. H. Stewart, of Trail, B.C., general manager of the Consolidated Mining and Smelting Company of Canada, Ltd., was in Toronto last month to attend that company's annual general meeting of shareholders.

Prof. Francis A. Thomson, dean of the College of Mining at the Washington State School, Pullman, Washington, visited mines in Ainsworth camp, B.C., in October.

SPECIAL CORRESPONDENCE

ONTARIO.

COBALT, GOWGANDA, SOUTH LORRAIN

NIPISSING PRODUCTION.—Nipissing produced $226,420 last month and shipped $290,473. Of the shipments $252,844 was shipped as bullion. It is probable that the Nipissing will ship out no more ore from the mine, but that any low grade they may mine before the low grade mill is ready to run will be left in the stopes. Developments underground during the month were quite satisfactory. Cross-cutting from the Kendall shaft some high-grade ore has been picked up under the Little Silver vein, a hundred feet below the open cut where the Little Silver vein was mined in the early days of the camp. A new branch of the Meyer was also picked up and drifted upon for 80 feet showing three inches wide of 2,000 ounce ore. A new vein, probably an off shoot of 101 [illegible]owed abou[illegible] two inches of the same grade ore.

At shaft 64 exploration work is still continued, and the shaft is being sunk, while near the Savage boundary another level will be established, from which cross-cutting will be commenced.

SENECA-SUPERIOR DISCOVERY AT CART LAKE.—What has every appearance of being the most important discovery of the year on the smaller properties of the camp was made on the Seneca-Superior lease on Cart Lake last week. Some time ago the Seneca-Superior, a Rochester company, took over the Kerry lease on Cart and Peterson Lake and has been working them. The new management paid more attention to the Cart than the Peterson Lake lease, and their perseverance was rewarded when a vein of high-grade ore was cut at the 200-foot level. A cross-cut was being driven underneath the lake in a south-easterly direction, and at a distance of 440 feet from the shaft a vein of 2,000 to 3,000 ounce ore about three inches wide was opened up. The vein is in the conglomerate, and is well defined.

The strike will give the greatest encouragement to the properties working round Cart and Peterson Lake. So far the leases on Peterson and Cart Lake have met with but scanty success, the Little Nipissing and the Nova Scotia leases being the only shippers. On Cart Lake no ore had been discovered at all since the Nipissing abandoned their work there.

McKINLEY-DARRAGH ENCOURAGING.—Owing to a discovery of a wonderfully rich shoot of ore under Cobalt Lake the McKinley-Darragh-Savage is to day well ahead of its scheduled production. There have already been produced this year 2,240,000 ounces, or only 360,000 ounces less than for the whole of last year. The increase is very largely due to the 800,000 ounces taken from a very rich shoot of ore on the second swamp vein, as the mill has been treating about the usual grade of rock and the same tonnage as last year. The aerial tramway to transport the Savage ore from that mine to the McKinley-Darragh mill is almost completed, and it is probable that the mill will be enlarged. So far the ore has been handled by a sorting plant at the Savage, the tailings being banked for further treatment. It is estimated that there are 37,000 tons of tailings which will run fairly high in silver at the Savage now, and it will form a good reserve for a steady production of milling rock to the mill at the parent mine.

CONIAGAS RETURNS ITS CAPITALIZATION.—The Coniagas has now joined the list of Cobalt companies that have paid more than the total amount of their capitalization back to shareholders. There was some surprise when the May dividend declaration was made to find that three per cent. had been cut off the regular quarterly disbursement of nine per cent. As it was understood very generally that the reduction was necessary to again help the Coniagas smelter at Thorold, and not from any mine reasons, the declaration did not cause any uneasiness. On November 1, however, the Coniagas will not only pay their usual nine per cent., but will add the three per cent. held over from May 1. The Coniagas has now paid back to its shareholders 107 per cent., or $4,280,000. Five years of careful mining have been required to attain this end. For the first three years the Coniagas only paid 3 per cent. per quarter, no one at that time appreciating the great possibilities of the property. In the last two years the narrow rich streaks of high-grade have been found to be the centre of large bodies of milling ore.

TEMISKAMING AFFAIRS.—According to the quarterly statement of the Temiskaming Cobalt Mining Company there is yet to pay on the North Dome at Porcupine $55,000. The company has cash in banks amounting to $255,650, the smelters owe $65,802, and there is $34,261 in ore on hand. From this amount must be deducted the quarterly dividend of 3 per cent., $75,000, and the deferred payments yet to make on the North Dome, amounting to $55,000. The Temiskaming has now encountered at their 640-foot level enough silver in the diabase to greatly encourage them to go ahead and develop in that formation with a good hope of encountering rich ore there.

COPPER AND NICKEL FROM DANE.—Copper and nickel now form an integral part of the shipments from Northern Ontario camps. The Dane Mining Company shipped out one car of chalcopyrite which ran over 15 per cent. in copper, but they will send out no more until the sleighs can run over the snow. Underground operations have been discontinued in favour of diamond drill work, one drill operating to pick up the continuation of the ore bodies at depth, the other working on some other claims of the company near Swastika. There are two distinct ore bodies being worked, copper occurring in one place in a quartz gangue, and in the other as massive chalcopyrite ore.

The Alexo mine at Iroquois Falls continues to pour out a steady stream of ore. During September seven cars, containing 294.60 tons, left the mine for the Mond Nickel Company's works at Victoria Falls. The ore is being mined on a most economical basis, and a profit is being made despite the narrow market.

BEAVER.—The fact that values in the Beaver veins when they are followed in the diabase are distributed over a wider area, has led the management to resolve to increase the capacity of their plant to 120 tons in place of 60 tons. In the keewatin, the veins were very high grade, and the shoots were fairly wide, in the diabase these veins are broken up into stringers and the wall rock between them will make good milling rock. The 600-foot level of the Beaver has just been reached, and on the main vein a shoot of 2,000 ounce ore has been opened up. On the Donaldson property at Elk Lake, which the Beaver auxiliary mines are working, a new shaft is being sunk to the 200-foot level. A good plant has been ordered, and can be installed as soon as delivery is made.

HOLLINGER DIVIDEND. The Hollinger Gold Mines, Limited, has introduced the Porcupine camp as a dividend producer with a disbursement of 3 per cent., to be paid on Nov. 2. That, in all likelihood, dividends will be paid monthly is evident from the manner in which the first dividend is announced. "It is stated, notice is hereby given that a dividend of 3 per cent. on the capital stock of the company, being the first regular four-weekly dividend, has been declared payable 2nd November, 1912, to shareholders of record at the close of business on [illegible] October, 1912."

It is worth noting that the dividend is "four weekly," so that disbursements will probably be made every twenty-eight days or every lunar month. The amount involved in the first dividend is about $[illegible]. The news that a dividend had been declared came rather as a surprise to the general public, it being the general opinion that no dividend would be paid till the first of the New Year, when a substantial percentage would be declared and the mine would go on a regular quarterly basis. In adopting four-weekly

payments the Hollinger is following the example of the Crown Reserve.

REA WILL RE-OPEN.—Owing to the solid progress the Porcupine camp has made in the last two months a much better feeling is apparent everywhere. Assessment work is verywhere being carried out, and there are many rumors of properties opening up, that have been closed down for some little time. It is understood that the Rea mine will be opened up again before the new year. More capital will be introduced and a new board of directors will be appointed. The closing down of the Rea was one of the worst disappointments in the history of the camp, and the resumption of work will be hailed as a happy augury.

The opening up of the Tough claims at Swastika has led to a very careful examination of all the territory near Kirkland Lake in Teck and Lebel townships with the results that several promising discoveries have been made. The Costello, Terry, Wright, Hargreaves, and Oakes finds are all interesting. The Oakes discovery has just been made. The ore body is right on the contact between the porphyry and the conglomerate, precisely as the Tough's is. The gold is found in quartz stringers in the porphyry. It is understood that the two tons of ore shipped from the Tough claim ran $400 to the ton. It was taken from the surface of three different veins.

SWASTIKA MILLS.—At Swastika itself two mills should be ready to run before the first of January. The Swastika mill building is completed, but the machinery has not yet arrived, and as it has only been ordered recently delivery cannot be expected for at least a month. At the Lucky Cross excavations have almost been completed for the ten stamp mill. Five stamps will be installed at once and five later on. The first recovery will be made on plates directly below the stamps, the tails will go to a classifier and two deister tables, and will be re-ground in a pebble mill below which will be another plate and a slime table. Work underground is now confined in putting through raises to the surface and in sinking the shaft to the 200-foot level. Four raises are being put up, two on the vein 16, and one each on veins 18 and 11 respectively. The raise on No. 11 will also connect with veins 9 and 10.

NIGHT HAWK LAKE.—Quite a little excitement has been caused by the production of some very rich specimens from a vein discovered by a Montreal syndicate on an island in Night Hawk Lake. The claims are owned by Gordon Hyde and Fred M. Markey, both of Montreal, and the lead was uncovered in the course of assessment work. The island, which is only 150 feet in width, is on the eastern boundary of Cody township. The vein is but narrow. The claims were staked in the 1907 rush to Night Hawk Lake, when a number of Swedes found good ore on Gold Island.

LARDER LAKE.—Goldfields, Limited, is now dropping twenty stamps on ore at the old Harris Maxwell mill. The big crusher has been broken and when it can be repaired another ten stamps will be in operation. The ore is being mined from an open cut. There is apparently a large body of ore, but it is yet a matter of doubt if it is high grade enough to be handled at a profit unless a big tonnage is treated daily.

BRITISH COLUMBIA.

The fourth quarter of the year has been entered upon without serious interruption to the production of minerals in the Province, except at the coal mines of the Canadian Collieries (Dunsmuir), Limited, at which—both at Union and Extension Collieries—the miners have been on strike about a month. However, at the time of writing news has been received that some of the men have resumed work, so it is probable the trouble will have been settled by the time this shall appear in print.

Cariboo District.—While it is yet too soon to obtain dependable information concerning the season's results from placer-gold mining in Cariboo District, there is reason to look for a comparatively small yield of gold for 1912, since the season has been very dry in that particular district, and, as a consequence, the supply of water for gravel-washing limited. It is a remarkable thing that while to the south of the Cariboo placer-mining district the season has been unusually wet, in the part of the country whence comes the supply of water for placer-mining uses the opposite has been the case. It had been expected that the total of placer gold from Cariboo and Quesnel mining divisions of this district would be considerably larger than in several recent years, but the probability is that Cariboo division will show a further decrease, while Quesnel will have had the benefit of operations at two new properties, which should give that part of the district an increase, possibly large enough to fully offset the expected shortage in Cariboo division.

East Kootenay District.—Within the last few days—that is, during the first half of October—there have been reports of possible trouble at some of the Crow's Nest Pass coal mines, but it is earnestly hoped it will be averted. Save for occasional shortage of railway cars, work has been continuous at Crow's Nest mines in British Columbia, and it has seeme dthat the year's output of coal would be a comparatively large one. If there shall come a suspension of mining at the Crow's Nest Pass Coal Company's mines, the year's production of coal will be unfavourably affected accordingly. However, it may be that the men will continue at work, and if so the total output of the Southeast Kootenay coal mines will probably prove to have been larger than in any year in the past. This suggestion is made, though, without any statistics of output available, and only on the reports received of the mines having been worked with little interruption during the greater part of the expired nine months of the current year.

In metalliferous mining, the most important operations have been at the Sullivan Group lead-silver mine, near Marysville, which are reported to have already shipped this year, that is, during nine months of the calendar year, more ore than during the whole of the fiscal year ended June 30, last. For an output of about 21,000 tons in the last-mentioned year, the average metal contents were approximately 10 oz. silver a ton and 25 per cent. lead. A small number of men have been employed at the St. Eugene lead mine, but production has been very small in comparison with the output from this mine during earlier years. While work has been done on other mining properties, no production worth mentioning has been made. Placer-mining for gold has been continued on several streams, but only on a small scale.

The construction of the Kootenay Central Railway from Golden up the Columbia valley and thence down the Kootenay valley to the Crow's Nest Railway is being activly proceeded with, so mining will likely again have attention in these valleys ere long.

West Kootenay.—One of the most satisfactory features in connection with mining in this district is the fact that at least three metal-mining companies operating in West Kootenay have this year paid dividends. These are the Consolidated Mining and Smelting Com-

pany of Canada, the Standard Silver-Lead Mining Company, and the Le Roi No. 2, Ltd. The aggregate amount paid this year by these several companies is about $587,000, and there is good reason to expect that the Standard Company will pay $100,000 more before the close of the year. This reference to dividend-paying suggests that the following information concerning the Consolidated Mining and Smelting Company will be of interest:

Prior to the payment in October of the dividend of four per cent. declared at the Consolidated Company's annual meeting, no dividend had been paid by the company since November, 1907, so that nearly five years had lapsed since there had been a distribution of profits among the shareholders in the company. The original company was incorporated under Dominion charter as the Canadian Consolidated Mines, Ltd., with an authorized capital of $5,500,000 in 55,000 shares of $100 each. It acquired the properties of the St. Eugene Consolidated Mining Company, Centre Star Mining Company, Canadian Smelting Works, and Rossland Power Company. Under date February 26, 1906, the directors reported to shareholders that the St. Eugene, Centre Star, War Eagle, Trail Smelter, and Rossland Power Company had been consolidated, and that supplementary Letters Patent had been obtained changing the name of the company to "The Consolidated Mining and Smelting Company of Canada, Limited." The financial statement then issued showed a valuation of $3,900,000 as that of "mines, pjlants, smelter, refinery, stocks of other companies, etc.," and other assets of a total value of $798,888. The capital stock issued was $4,698,888. During the fiscal year ended June 30, 1910, an increase of the total of the authorized capital of $7,500,000 took place. At the end of June, 1912, the total of capital issued stood at $5,805,200; while the assets included mines, mineral claims, etc., valued at $4,774,861, and mining, smelting, and other plants at $1,412,975. At June 30, 1907, the liability to sundry banks was $1,723,709; at June 30, 1912, it was $343.820. The list of dividends paid by the company follows:

Dividend.	Paid.	Amount.
No. 1	May 1, 1906	$117,470
2	August 1, 1906	117,470
3	November 1, 1906	117,470
4	February 1, 1907	120,845
5	May 1, 1907	120,845
6	August 1, 1907	120(845
7	November 1, 1907	66,940
8	October 17, 1912	232,208
	Aggregate of dividends	$1,014,093

Reference to individual mining properties in the several mining divisions of West Kootenay must be brief this month, but these will have attention later. In Ainsworth camp, the No. 1 and other properties are being worked by the Consolidated M. and S. Co. Across the lake from Ainsworth, the Blue Bell is producing freely and keeping its concentrating mill running, concentrate being shipped to the smeltery at Trail.

The Whitewater mines are being worked by Retallack & Co., and since the railway is to be extended from Bear Lake to Whitewater, the same company will resume work in the Deep mine of the same group. The Utica is being further developed, and about 400 tons of ore had been received at Trail this year from this mine up to the end of September. The Lucky Jim has been shipping zinc ore for two or three months, and it is expected that an output will be steadily maintained. The Rambler-Cariboo aerial tramway has been completed, and equipment of the concentrator is in progress. A number of mines about Sandon, Cody, and other parts of Slocan are being worked, while there is much activity also in Silverton camp, near Slocan Lake.

News of Nelson, Rossland, Boundary, and Similkameen camps is generally satisfactory, and these will have attention later.

Coast District.—There is much activity at the Britannia mines, on Howe Sound, also at the Granby Co.'s Hidden Creek mines, Observatory Inlet. Portland Canal and Skeena districts are also having development work done in them. Altogether, there is general progress in mining in British Columbia, and the outlook is promising.

COMPANY NOTES

GRANBY CONSOLIDATED ANNUAL REPORT.

The Granby Consolidated Mining, Smelting and Power Company, Limited, has issued its annual report for the fiscal year ended June 30, 1912. The annual general meeting of shareholders was held in New York on October 1. Among the directors of the company present were Mr. Jay P. Graves, of Spokane, Washington, vice-president and general manager, and Mr. Geo. W. Wooster, of Grand Forks, Boundary district, B.C., treasurer. At the meeting the number of directors on the board were reduced from 15 to 13 by the retirement of Messrs. Arthur Curtiss James, who resigned some months ago, and A. L. White. Mr. W. H. Nichols was elected president of the company, succeeding Mr. George Martin Luther, last year's president.

The general balance sheet, as at June 30, 1912, is as follows:

Assets.

Cost of lands, plants, etc. (less depreciation)	$15.081.000
Stocks and bonds	519.333
Hidden Creek property investment	979.461
Fuel and supplies	164.191
Cash and copper on hand	791.789
	$17.535.780

Liabilities.

Capital stock issued	$14.988.515
Dividends held	1.605
Accounts payable	19.539
Surplus	2.516.121
	$17.535.780

Published figures show that the quantity of ore smelted during the ye[illegible] at the company's works at Grand Fork[illegible], was 739.519 tons, consisting of 721.719 tons [illegible]m the company's mines at Phoenix, and 17.800 t[illegible]s of custom ore. The corresponding figures for [illegible] year ended June 30, 1911, were: Granby ore [illegible] tons, custom ore, 24.78[illegible] tons; total ore smelted [illegible]84.346 tons.

The metals produc[illegible] year and the latter shown here for comparativ[illegible] those produced in the fiscal year to June [illegible] as under:

	In Fiscal Year Ended June 30, 1912.	June 30, 1911.
Copper, lb.	13,231,121	17,858,860
Silver, oz.	225,395	343,178
Gold	33,932	41,707
Amount realized	$2,874,759	$3,219,272
Working expenses, purchase of ore, etc.	$2,291,380	$3,001,856
Net profit	$583,379	$217,416

It will be seen that there was a general decrease, excepting only in amount of net profit earned. The several decreases were: In ore smelted, 244,827 tons. In metals produced: Copper, 4,627,739 lbs.; silver, 117,873 oz.; gold, 7,775 oz. In proceeds of metals sold, $344,513. The net surplus of assets over liabilities, after writing off $600,562 for depreciation, is shown as $2,516,121, as against $2,533,304 at the close of the 1910-1911 period, the decrease being $17,183. No dividend has been paid since December, 1910, but for some time past profits have been applied to payment of purchase money, and development and equipment costs, of the company's Hidden Creek property, near Granby Bay, Observatory Inlet, at which there has already been developed ore "estimated in sight" to an approximate total of 5,000,000 tons, with an average copper content of 2.3 per cent., or 46 lbs. to the ton. The "Boston Commercial" calculates last year's net earnings at $3.90 a share of the company's issued capital, as against $1.47 a share for the immediately preceding year.

It should be kept in mind when considering the results of the two years' operations, that conditions were unfavourable during part of each of the fiscal years. In his report for the fiscal year ended June 30, 1911, the general manager said: "The earnings for the year are not at all satisfactory, amounting to but $217,415.61 net profits. This is accounted for by the fact of the lower tonnage treated and the disconnected periods of operation, part of the furnaces being out of commission most of the time, causing increased costs, the low prices at which metal was sold, the lower recoveries from the ore, and the high price paid for coke and the inconvenience in securing it. The continued strike at the coal fields in British Columbia of the Crow's Nest Pass Coal Company, from which place we get our coke and which is the only present available source for our supply, caused the closing down of our plant about May 15th for six weeks, the strike having been in effect since April 1st." During the last fiscal year the smelting plant was inoperative for rather more than four months —from August 15th to December 1st. However, when smelting was resumed (and it has been continued ever since, without interruption) results were satisfactory, as indicating in the following extract from the general manager's report for the last fiscal year: "Since resuming operations at the smeltery, December 1st, 1911, the general results in unit cost have been satisfactory and except for the excessive cost of coke which was secured from the East for a time before shutting down, the operations for the year would have shown substantial improvement over the unit cost of any previous year. The plant is in excellent condition, and there is no reason known why we may not expect as good, or better, smelting results in the future."

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Cobalt, October 19.—The week's shipments contained twelve cars of high-grade, with only two low. The Penn-Canadian shipped a car of concentrates during the week, the second shipment since their operations at the old Cobalt Central property. Lost and Found, a North Cobalt property, appears with a small shipment of low grade. McKinley leads for the week.

The following are shipments in pounds:

Cobalt Lake	1 high	47,000
Cobalt Townsite	1 high	72,000
McKinley-Darragh	3 high	203,870
O'Brien	2 high	128,200
La Rose	1 h. 1 low	135,400
Hudson Bay	1 high	61,707
Crown Reserve	1 high	39,105
Penn-Canadian	1 high	67,509
Lost and Found	1 low	25,600
Buffalo	1 high	60,600
Totals	12 h. 2 low	840,991

The bullion shipments during the week struck a new high level. Nipissing and Crown Reserve were the only shippers sending their bullion to England Tuesday. Details follow:

	Ounces.	Value.
Crown Reserve	7,023.00	$ 4,353.64
Nipissing	154,273.52	99,521.03
Totals	161,296.52	$103,874.67

BRITISH COLUMBIA ORE SHIPMENTS

Ore shipments for the various districts and smelter receipts for the week ending October 12th, were as follows:

East Kootenay.

	Week.	Year.
Sullivan	518	24,331
St. Eugene	33	409
Monarch	36	1,139
Monarch, milled	425	8,575
Other mines	...	235
Total	1,012	[illegible]

Rossland.

Centre Star	2,627	123,819
Le Roi No. 2	560	20,303
Le Roi	967	35,632

Le Roi No. 2, milled	300	7,100
Inland Empire, milled	90	1,350
Other mines	...	291
Total	4,544	188,495

Boundary.

Granby	25,814	987,417
Mother Lode	6,157	293,475
Unnamed	166	9,737
Rawhide	6,153	189,093
Napoleon	392	8,078
Belcher	425	885
United Copper	77	1,171
Surprise	59	4,058
Nickle Plate, milled	1,500	59,600
Jewel, milled	200	800
Other mines	...	20,012
Total	40,943	1,574,326

Slocan and Ainsworth.

Bluebell	181	1,535
Silver Horde	25	95
Standard	235	6,925
Van-Roi	31	1,946
Richmond-Eureka	37	1,111
Whitewater	33	649
Standard, milled	400	14,000
Van-Roi, milled	1,100	45,900
Bluebell, milled	200	2,500
Other mines	...	10,953
Total	2,242	85,614

Nelson.

Hudson Bay	18	583
Molly Gibson	19	2,003
Emerald	109	1,282
Granite-Poorman	30	283
Granite-Poorman, milled	250	11,100
Mother Lode, milled	500	8,250
Queen, milled	300	10,200
Molly Gibson, milled	300	6,000
Other mines	...	5,987
Total	1,596	45,688

B. C. Copper Company's Receipts.
Greenwood, B.C.

Mother Lode	6,157	293,475
Unnamed	166	9,737
Rawhide	6,153	189,093
Napoleon	392	8,078
Belcher	425	885
Other mines	...	17,003
Total	13,293	518,271

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	25,814	987,417

Consolidated Company's Receipts.
Trail, B.C.

Centre Star	2,627	123,819
Le Roi No. 2	560	20,303
Le Roi	967	35,632
Sullivan	518	24,331
St. Eugene	33	409
Monarch	36	1,139
Bluebell	181	1,535
Silver Horde	25	95
Standard	235	6,925
Van-Roi	31	[illegible]
Richmond-Eureka	37	1,111
Whitewater	33	649
United Copper	77	1,171
Surprise	59	4,058
Hudson Bay	88	583
Molly Gibson	19	2,003
Emerald	109	1,282
Granite-Poorman	30	283
Snowstorm	118	118
Other mines	...	15,356
Total	5,783	[illegible]

TORONTO MARKETS.

October 24.—(Quotations from Canada Metal Co., Toronto).
- Spelter, 6.35 cents per lb.
- Lead, 6.15 cents per lb.
- Antimony, 12 cents per lb.
- Tin, 52 cents per lb.
- Copper, casting, $18\frac{1}{2}$ cents per lb.
- Electrolytic, $18\frac{1}{2}$ cents per lb.
- Ingot brass, 11 to 15 cents per lb.

October 24.—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
- Summerlee No. 2, $23.00 (f.o.b. Toronto).
- Midland No. 1, $22.00 (f.o.b. Toronto).
- Midland No. 2, $21.50 (f.o.b. Toronto).

GENERAL MARKETS.

- Coal, anthracite, $5.50 to $6.75.
- Coal, bituminous, $3.50 to $4.50 for $1\frac{1}{4}$-inch lump.

Coke.

Oct. 22.—Connellsville Coke (f.o.b. ovens).
- Furnace coke, prompt, $3.75 to $4.00 per ton.
- Foundry coke, prompt, $4.00 to $4.25 per ton.

October 22.—Tin, Straits, 50.25 cents.
- Copper, Prime Lake, 17.60 to 17.80 cents.
- Electrolytic copper, 17.50 to 17.70 cents.
- Copper wire, 19.00 cents.
- Lead, 5.10 cents.
- Spelter, 7.60 cents.
- Sheet zinc (f.o.b. smelter), 9.00 cents.
- Antimony, Cookson's, 10.50 cents.
- Aluminium, 26.25 to 28.00 cents.
- Nickel, 45.00 cents.
- Platinum, ordinary, $45.50 per ounce.
- Platinum, hard, $48.00 per ounce.
- Bismuth, $2.00 to $2.25 per lb.
- Quicksilver, $41.00 per 75-lb. flask....

SILVER PRICES.

	[illegible]	[illegible]
	[illegible]	pence.
October 8	[illegible]	[illegible]
" [illegible]	$63\frac{7}{8}$	[illegible]
" 10	$63\frac{3}{8}$	[illegible]
" 11	[illegible]	[illegible]
" [illegible]		$29\frac{1}{4}$
" [illegible]	[illegible]	[illegible]
" 15	[illegible]	[illegible]
" [illegible]	[illegible]	[illegible]
" 17	[illegible]	[illegible]
" 18	$63\frac{5}{8}$	[illegible]
" 19	[illegible]	[illegible]
" 21	[illegible]	[illegible]
" [illegible]	63	[illegible]

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

Dominion of Canada.

Ontario

Astley, J. W.
Bewick, Moreing & Co.
Cohen, G. W.
Campbell & Deyell
Carter, W. E. H.
Demorest, Stull & Low
Evans, J. W.
Ferrier, W. F.
Forbes, H. L.
Graham, S. N.
Gwillim, J. C.
Hassan, A. A.
Hore, R. E.
Haultain, H. E. T.
Hille, F.
Leckie, J. E.
Loring, F. C.
McEvoy, Jas.
Miles, A. D.
Scott, O. N.
Segsworth, Walter E.
Smith, Alex H.
Spenc r, W. H.
Sutcliffe, & Neelands
Tyrrell, J. B.
Willmott, A. B.

Quebec

Cohen, S. W.
DePencier, H. P.
Hardman, J. E.
Hersey, Milton L.
Johnson, W. S.
Smith, W. H.
Obalski & Dulieux
Ross, J. G.
Woolsey, W. J.

British Columbia

Ashworth, James
Fowler, S. S.

FOREIGN-New York

Hassan, A. A.
Hore, R. E. Houghton, Mich.
Constant, C. L. & Co.

ASSAYERS, CHEMISTS AND ORE TESTERS.

Dominion of Canada

Ontario

Brown, A. H.
Campbell & Deyell
Heys, Thos. & Son.
John, D.
Canadian Laboratories, Ltd.
McNeill, W. K., Manager

Quebec

Hersey, Milton Co., Ltd
Obalski & Dulieux
Dr. J. T. Donald

British Columbia

Bryant C. M. & Co.

Foreign-New York

Ledoux & Co.
Carey, E. E., Cal.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

PROFESSIONAL : DIRECTORY.

CONTINUED FROM PRECEDING PAGE.

ENGINEERS, METALLURGISTS AND GEOLOGISTS.

HILLE, F.

Mining Engineer.

Mines and Mineral Lands Examined and Reported On.

Port Arthur, Ontario, Canada.

HANDLEY, JOHN

Mining Engineer and Metallurgist

SUDBURY, ONT.

Code: Bedford McNeill, 1908.

HARDMAN, J. E.

Consulting Mining Engineer

MONTREAL, CANADA.

GUESS & HAULTAIN

Mining & Metallurgical Engineers

123 Bay Street

TORONTO CANADA

HORE, R. E.

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

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1147. Map 19A. Lardeau, West Kootenay, B.C. Topographical scale 4 miles to 1 inch. Contour interval 500 feet.

1197. Map 47A. Law's Mining Camp near Tulameen, B.C. Geological. Scale 600 feet to 1 inch. Contour interval 50 feet

1219. Map 54A. Nanaimo Coal Area, Vancouver Island, B.C. Scale 1½ miles to 1 inch. Contour interval 100 feet

YUKON and NORTH WEST TERRITORIES

1089. Map 9A. Explored Routes on Parts of the Albany, Severn and Winisk Rivers. Scale 8 miles to 1 inch.

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THE CANADIAN MINING JOURNAL

VOL. 33 TORONTO No. 22

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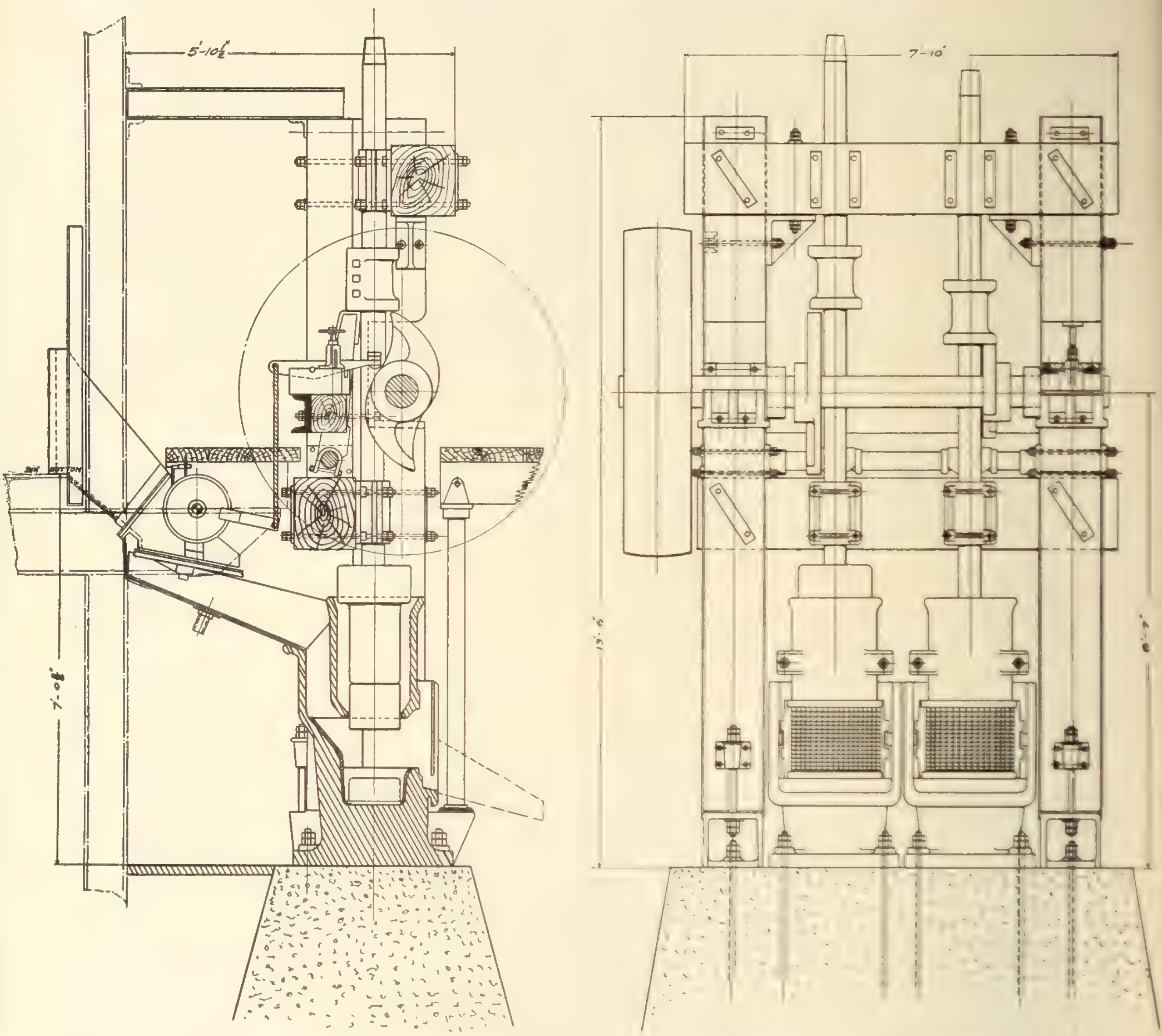

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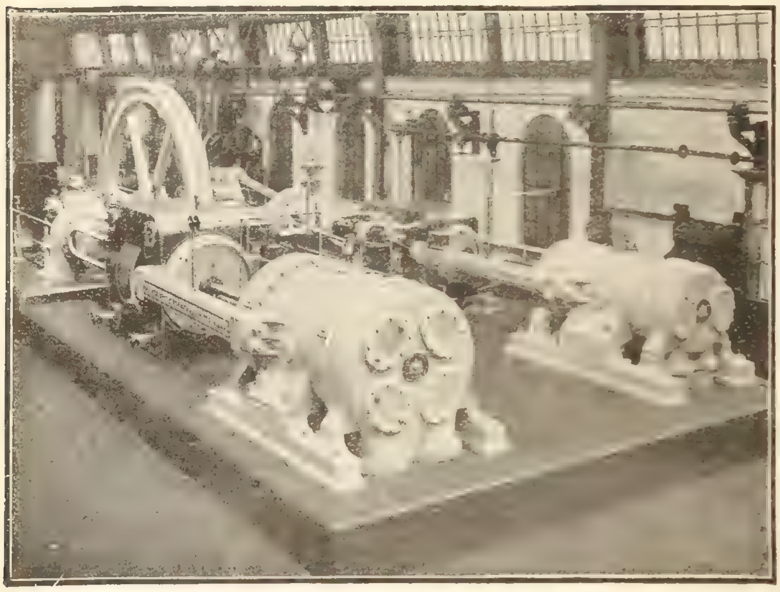

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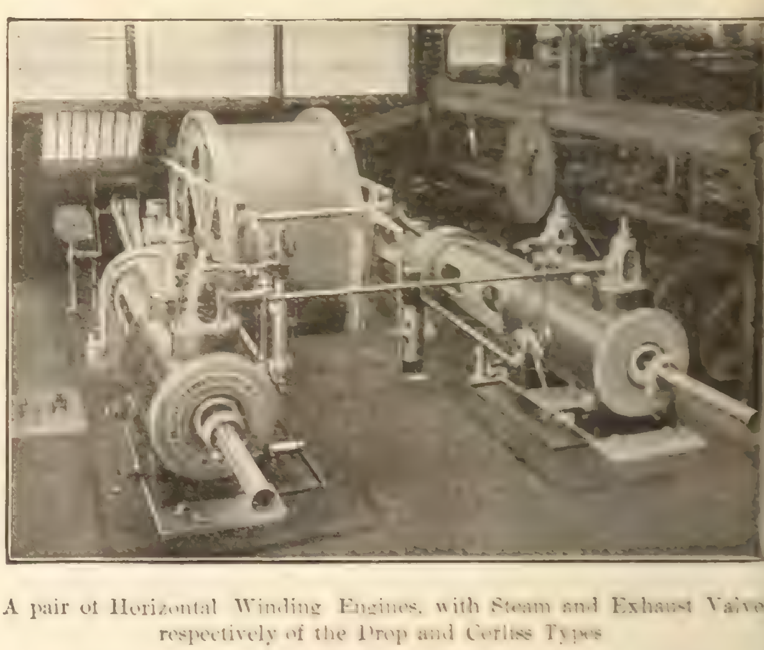

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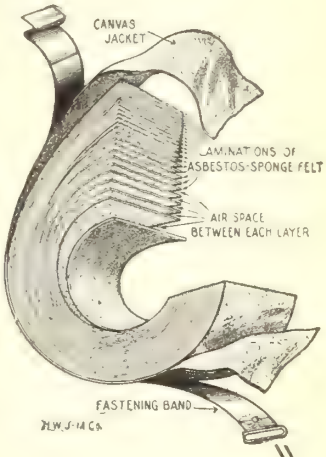

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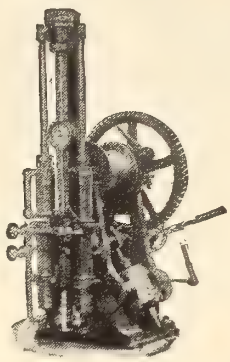

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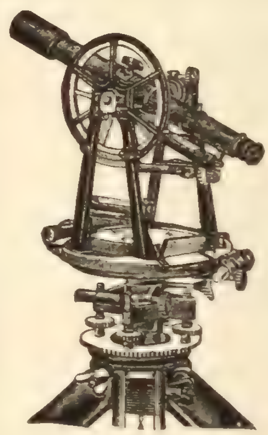

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, November 15, 1912. No. 22

The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.

MINES BRANCH SUMMARY REPORT.

The summary report of the Mines Branch of the Department of Mines, Ottawa, for the calendar year ending December 31st, 1911, has just been received. During that year, according to the statement of the director, Dr. Eugene Haanel, four technical officers have been added to the regualr staff, and three clerks to the non-technical staff. There are now nine divisions, each under a chief officer and all fully organized, except that of the explosives division. Mr. J. G. S. Hudson is the only officer assigned to this division, nor will additions be made until the proposed Explosives Bill shall have become law. That there is dire need of a restrictive law is becoming more and more evident every day. It is to be hoped, therefore, that the Mines Branch will very soon be enabled to complete this important part of its organization.

The preliminary reports on field work deal with a large variety of subjects—the building stones of the Maritime Provinces, the nickel industry, copper and pyrites, iron ore, Canadian markets for mineral products, gypsum and salt, feldspar and phosphite, moisture in fuels, explosions, statistics, etc.

It is a matter for congratulation that the Mines Branch is now comfortably and adequately housed in the building formerly occupied by the Geological Survey Branch. This old structure, whose walls are more than ordinarily sound, has been completely reconstructed inside, has been added to, and has, moreover, been most ingeniously adapted to the needs of the Mine Branch. Its convenient situation is a great advantage. Instead of occupying parts of five scattered buildings, the Mines Branch staff is now consolidated under one ample roof.

Reference is made by the director to an arrangement entered into by the branch with the Kingston School of Mining. Under this arrangement the School of Mining has undertaken to carry on for the Mines Branch certain metallurgical investigations "of a directly economic character." Dr. Herbert T. Kalmus, formerly of the Massachusetts Institute of Technology, has been chosen to direct this work. The investigations will cover the uses of cobalt and its alloys, the uses of nickel copper iron alloys, and the electrical smelting of iron ores.

The Mines Branh, judging from the summary report, is making a vigorous attempt to widen its sphere of usefulness and to direct its efforts in channels of economic importance.

DREAMS.

The Standard Coal Company of British Columbia, if one may believe Mr. W. F. Alloway, jr, trustee, is a

wonderful concern, and evidently differs in many radical respects from the usual Canadian coal company. The advertisement of the flotation of this remarkable corporation has for some time past been appearing in the financial advertisements of the Montreal Star and occupies a full quarter page. The "trustee' must be a benevolent person to spend so much good money in advertising so unusual an opportunity to make money quickly and easily. The caption of the ad. reads: "Hundreds are Homeless," words that at first sight do not seem germane to the prospectus of a coal mining "corporation." Upon reading further, however, it is learned that many persons are to-day homeless and impecunious who might have been wealthy had they, in their youth, made judicious investments in the first stock offerings of successful Canadian companies. Such investments, for instance, as the Standard Coal Company. The statement is made that any person who had invested ten dollars in the common stock of the Crow's Nest Pass Coal Company would at the present time be worth $38,000, had he retained his original holding. It would be interesting to have corroboration of this extraordinary appreciation in value from a shareholder of the Crow's Nest Pass Coal Company.

One gem of the advertisement—it is hardly correct to use the word "prospectus"—should be reproduced in full for the encouragement of despondent coal operators. It reads as follows:

"Right in the Province of Quebec to-day are many men who have amassed millions through coal operations. Even the small merchant who sells coal in a retail way attests to the profit he is making from the air of independence attendant upon his business, because coal is mined at a big profit and sold at a fair margin, and the price is controlled by the operator, not the retailer."

Many coal operators will be glad to learn that they control the price of coal, as this particular point has often worried them. They never would have suspected the fact.

The "trustee's" advertisement is as good as an encyclopedia. We learn that British Columbia has the largest mines in Canada, and that her coal deposits are "the greatest in extent in all America." This is certainly great news.

The advertisement further states that the Standard Coal Company's property embraces "thirteen square miles of coal lands under licenses from the Provincial Government at Vancouver, situated as follows:

"No. 1 mine—Six square miles on deep sea, Skidegate Inlet, Graham Island.

"No. 2 mine—Seven square miles on the east coast of Graham Island near Cape Ball, fronting on deep sea."

Nothing is stated regarding the thickness, quality or number of coal seams, of the pitch of the measures, or the conditions expected to be found in the operation of mining, and it is difficult to gather from the foregoing description of the properties whether No. 1 mine or No. 2 mine, are mines or areas. There is quite a difference between coal lands and a developed "mine," although many of those who subscribe for the stock of the Standard Coal Company will in all probability be incapable of appreciating the distinction.

Reading further one may gather that the directors of the company visited the property, and one of them spoke to the press representatives of Vancouver in "most glowing terms," stating from his own deductions "unconditionally and irretrievably that the property is destined to be one of the greatest coal properties in Canada." The wording of this emphatic opinion is peculiar, but what more could an investor desire than an "irretrievable opinion"?

The "trustee" who is "well and favourably known throughout the west and east, offers for sale shares held by him in the Standar Coal Company (par value of each share $1) at the present ground floor price of 25 cents per share." It is intimated that the price of shares will shortly advance to 35 or 40 cents in the very near future.

After this, who would be poor? It may be significant that the address of the trustee is in the Orpheum Theatre Building, Montreal. The man who hopes to obtain $38,000 in seventeen years on a ten dollar investment should expend his money in vaudeville. He will get much better value.

FOOLISH CRITICISMS

A prominent Nova Scotian educationist, speaking in Prince Edward Island, was responsible for the following: "We have depleted our soil partly ruined our fisheries, pawned our coal mines to monopolists, who take heavy toll."

This is typical of the over statements of the uninformed, the glittering generality of the casual observer. We would like to ask that educationist what he has to suggest concerning Nova Scotia's coal mines. Where, for example, will he find more competent mining and more adequate equipment than in Cape Breton? How would he propose to operate these mines if the corporations stepped out? Whom could he induce to take hold of the co-ordinated industries of coal mining and iron smelting? In other words, what possible constructive suggestion has he to make? What possible good can he hope to effect by talk of this kind?

THE HOLLINGER STATEMENT

The interim statement issued late in October by the Hollinger Gold Mines, Limited, shows a highly gratifying condition of affairs. The statement accompanied dividend cheques, the first of what are to be monthly 3 per cent. payments.

President Timmins is responsible for the statement that profits are now being made at the rate of $40,000 per week. As all expenditure, up to July 1st, 1912, was charged to capital account, this weekly profit looks healthy.

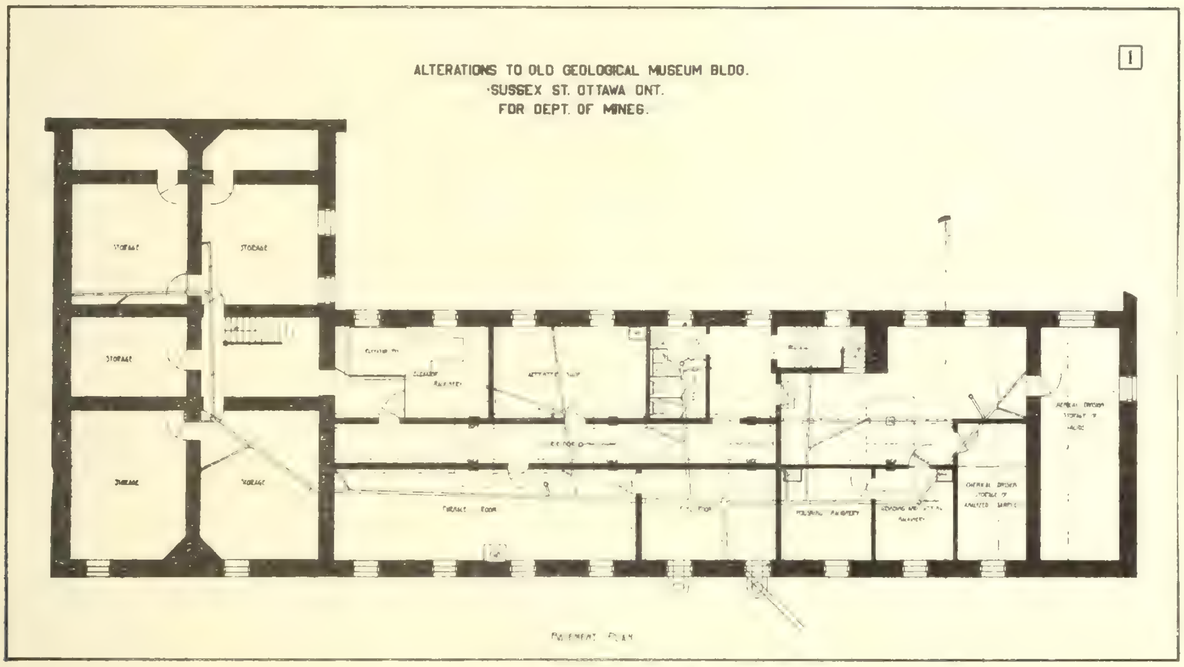
One of the best features of the Hollinger policy is the

fact that information is to be given promptly and regularly to the public. It is a matter of regret that this course is not pursued by all other mining companies. Nothing can be gained by secrecy. In fact, much may be lost. Unauthenticated rumours do harm. The corrective is to take the public into the confidence of the management.

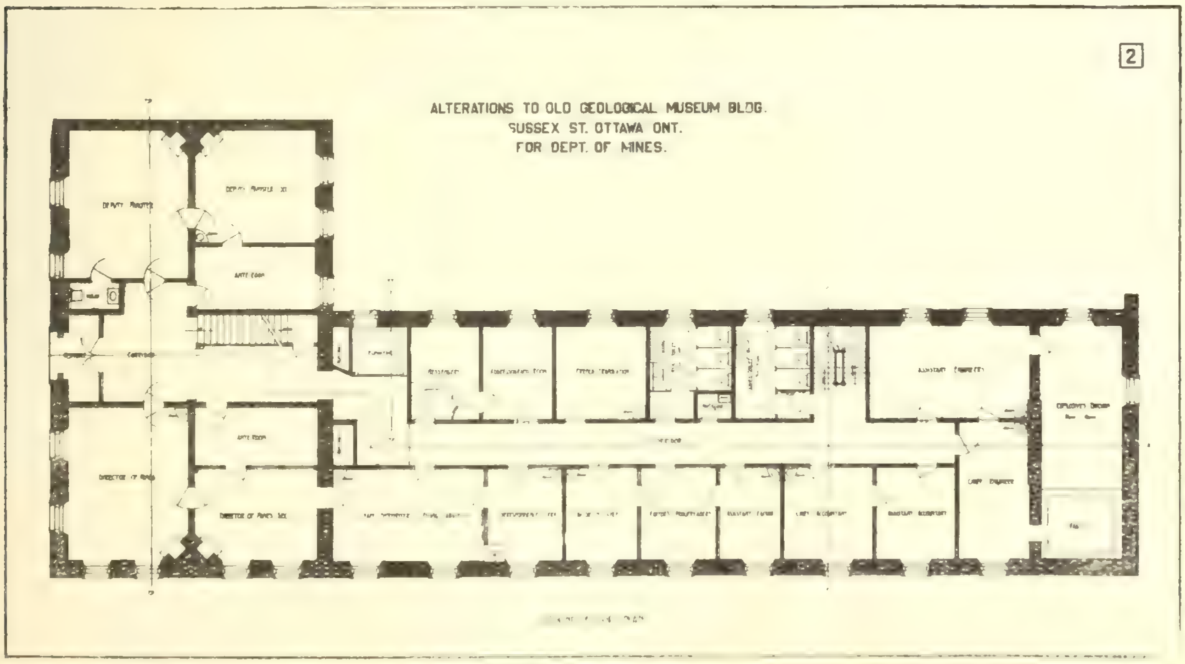
The statements that about 20,000 tons of ore have yielded an average of $19.70 per ton, that 5,777 tons of stoped ore contained $37.89 per ton, that the mill is now treating 300 tons per day, and that an extraction of 97 per cent. has been obtained, are remarkably cheering. They vindicate the general accuracy of Mr. Robbins' first report. Apparently there have been no disappointments in the matter of the gold contents of the ore.

With a surplus of about half a million dollars, earned since July 1st, of this year, the Hollinger is unquestionably in a position to pay dividends, provided, of course, that the ore reserves also warrant the step. This, until Mr. Robbins' next annual report, we may well take for granted.

The Hollinger has given Porcupine standing and dignity in the eyes of the public.



Refer to Editorial—Mines Branch Summary Report.



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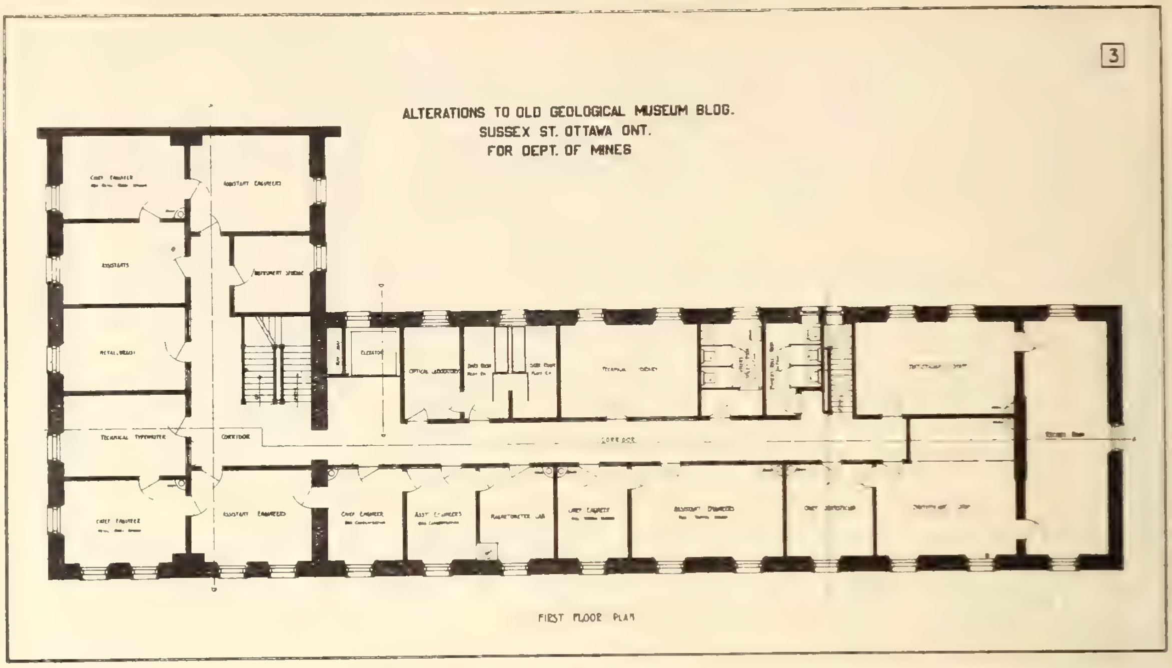


Fig. 3.—New Headquarters of the Mines Branch.

Refer to Editorial—Mines Branch Summary Report.

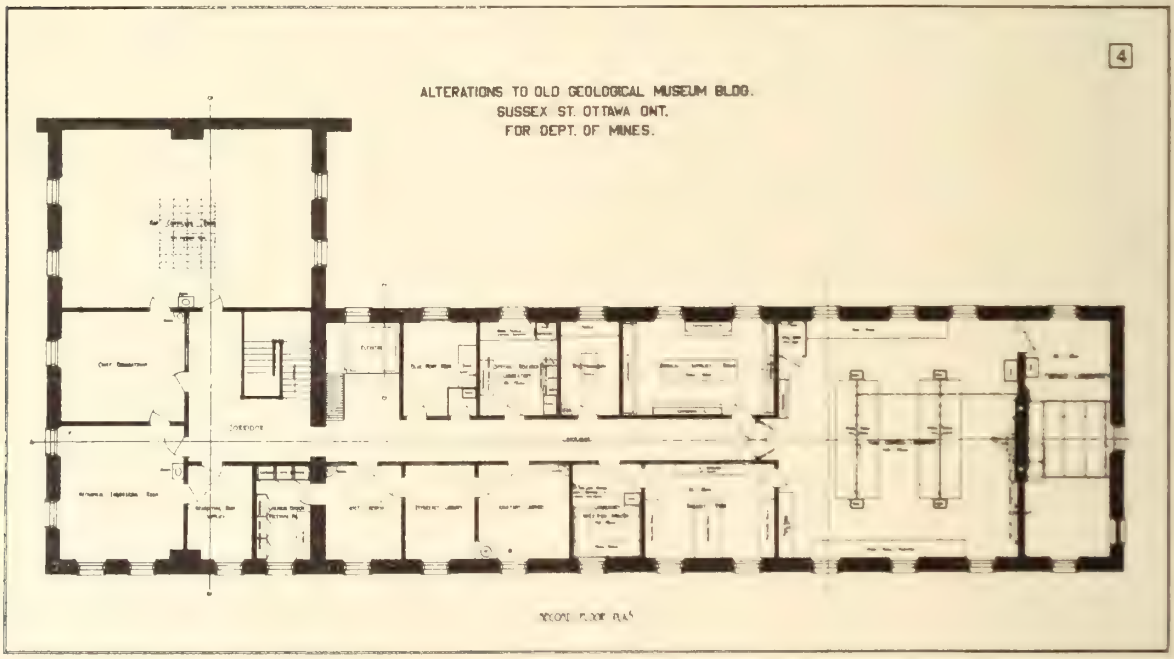


Fig. 4.—New Headquarters of the Mines Branch.

Refer to Editorial—Mines Branch Summary Report.

EDITORIAL NOTES.

Seven carloads of nickel ore, about 295 tons, were shipped recently over the T. & N. O. from Kelso to the Mono Nickel Company's smelter at Victoria mines. The consigner was the Kelso Nickel Mining Company, Ltd.

The resignation of Mr. M. J. Butler from the position of general manager of the Dominion Steel Corporation was not unexpected. While his absence will be felt, the fact that Mr. D. H. McDougall becomes his successor is extremely satisfactory. In years Mr. McDougall is very young, in experience, old. He has worked his way through many of the departments of the Corporation and has won and held the confidence of his superiors.

The Seneca-Superior mine (Cart Lake) has already shipped two cars of screenings and is bagging a car of very high grade ore. The new vein is improving.

The following gem is from a local newspaper. It calls for no comment:

ALUMINUM

Chemist.—Aluminum is chiefly manufactured from aluminum ore. It contains 11 minerals and 3 silicates. The minerals are: Cryolite, corundum, bauxite, diaspore, gibbsite, alunogen, aluminite, alunite, turquoise, wavellite and lazulite. The silicates: Kaolin, feldspar and mica.

CORRESPONDENCE

XPLOSIONS FROM FALLS OF ROOF IN MINES.

ditor The Canadian Mining Journal.

On returning to this city the writer finds your edi-on of the 15th inst., which contains voluminous ex-racts from a paper entitled the "Bellevue Explosions, lberta, Canada; an account of and subsequent investi-ation concerning Three Explosions produced by sparks rom falls of roof." This paper was read at the Sep-ember meeting of the Institute of Mining Engineers in ngland. Although the writer has already sent on ome notes on it to the Institute named, yet he thinks hat a few further remarks may not be out of place in he columns of your Journal.

The authors appear to have been mainly bent on a ampaign to refute the "views" of one mining en-ineer, who had the temerity to suggest that the disas-er of Dec. 9th, 1910, was due to what is termed his percussion theory." It may be pointedly remarked hat although the authors, Messrs. John T. Stirling, hief Inspector of Mines for Alberta, and Dr. Cadman f Birmingham, England, are so cocksure that that theorist was wrong, yet they cannot get along with their own theories without accepting his assumption, hat the "originating" cause of all three disasters re-erred to was due primarily to falls of roof. Why the uthors suppress the theorist's name is best known to hemselves, but as he is well known to both of them is identity need not be hidden, and therefore he is lad to acknowledge himself as the active "father" of he "percussion theory."

Unfortunately, the plan accompanying the Stirling-Cadman paper is not reproduced in your Journal, but its mportance will be readily understood when it is stated hat the fatal explosion of Dec. 9th, 1910, is placed as ccuring at a point in the mine where an assistant in-pector of mines reported in writing the day before the isaster that it was clear from gas. The writer ven-ures to say hat the fall of roof originating the first isaster did not occur where shown on the plan accom-panying the paper.

The authors do not seem to have taken into account hat there were quantities of explosive and detonators n the mine, and also that on the first occasion there vas a missed shot in one of the pillars which was being rawn. Whether or not this shot was exploded by the rushing of he pillar cannot now be stated with cer-ainty, but the fac remains, and the query may be xtended further by asking what became of the ex-plosives and detonators which were in the mine on the econd and third occasions?

The fatuous man, who wilfully made the dangerous experiment of rolling a large piece of rock down a chute for the fun of seeing the fireworks, forgot that the Act of Parliament scarcely countenances that sort of horse play.

With respect to the Draeger apparatus, Alderson is said to have lost his life through some leak—the fact is that he was not wearing any apparatus, and there-fore could not suffer from any leakage. In the paper the Draeger apparatus is credited with being instru-mental in saving 14 lives, whereas only two were thus saved.

The greatest value of a paper such as the one now referred to would have been in suggestions for the future safe working of this and similar mines, but we are not told what remedies are in force, excepting as temporary expedients, and the authors decline to dis-cuss the subject of filling the goaf spaces from the sur-face. The paper, in the writer's opinion, fails entirely to throw any fresh light on the Bellevue disasters.

In conclusion, although the theory of "percussion," or, as some prefer to call it, "compression," is practi-cally sneered at, yet the authors have carefully avoided any consideration of the force which blew out a wall of rock six feet in thickness in No. 4 cross pitch.

Your etc.,

JAMES ASHWORTH,

930 Drake St., Vancouver, B.C., Oct. 28th, 1912.

STILL MORE HISTORY.

Editor The Canadian Mining Journal.

Sir,—Dr. Barlow has avoided the issue by omitting the latter half of the statement I quoted from the article entitled "The Special Research, etc., etc." The complete sentence is, "McGill was the first of the Cana-dian universities to give instruction in mining and metallurgy as a regular course in 1871, **and again the first to create and equip an independent department exclusively devoted to the subject in 1896.**" Dr. Bar-low omits the part printed in black, the only part defi-nitely called in question by my letter. The emphasis on "practical provision" is sufficiently clear. The facts are as stated in my former letter. The Kingston School of Mining was "the first to create and equip an inde-pendent department exclusively devoted to the sub-ject." In 1893-4, it was in the hands of Colonel William Hamilton Merritt, a graduate of the Royal School of Mines, London. He was succeeded by Prof. Courtenay DeKalb, and both of these men confined themselves strictly to mining and metallurgy as sub-jects of instruction. The building of the Mining La-boratory in 1894 made possible for the first time in Canada, the carrying on of such large-scale investiga-tions as the concentration of the Ontario corrundum rock, a piece of work which was begun and completed in this laboratory.

That McGill had a course in mining before 1893 has not been questioned; and that some of the graduates of that early period are distinguished in mining and metallurgy is a well-known fact. How would it do for Queen's University to set up a claim to early educa-tional work in mining and metallurgy on the ground that she graduated in 1858 Dr. James Douglas, Presi-dent of the Phelps Dodge Co., and an acknowledged leader in mining and metallurgy?

If Dr. Barlow really wishes to give "honour to whom it is due" he will write in reply to this a nice letter acknowledging that it was the rather surprising pro-gress of the School of Mining which moved the McGill authorities to improve their facilities for the study of mining and metallurgy. I am,

Yours sincerely,

W. L. GOODWIN,

School of Mining.

Kingston, Ont., Nov 6, 1912.

THE EIGHT-HOUR DAY IN MINING.

Editor The Canadian Mining Journal.

Sir,—In your issues of 1st and 15th inst., you deal with the eight-hour day applied to mining.

In considering this question it is important to understand thoroughly that metal mining is the business of extracting metals from their ores and making them marketable at a profit. In accomplishing this, we must also bear in mind the professional and trade relationship that must necessarily exist between the human factor and the economic factor.

We have not only to extract metals from their ores at a profit and make them ready for market, but we must also conduct the various operations of exploration, mining, ore treatment, etc., in a thoroughly safe and workmanlike manner. We have, therefore, to consider the economic feature on the one hand, and the quality of work and the ease and comfort with which it is performed by the individuals in the industry, on the other.

You observe that "if the eight-hour day entails loss upon mine owners, and if the change brings a diminuion of output the mine-owners are amply justified in demanding full consideration of their rights" (namely, the retention of a longer day than an eight-hour day). This contention is not sound.

Mining is (barring the discovery of an orebody) practically an uncompetitive business. The forces and the agencies of nature place orebodies in certain places for our exploitation. If an orebody is a profitable mining venture it usually has sufficient metal content within a given area to warrant its extraction regardless of an eight or ten-hour day and regardless of twenty-five cents per hour or thirty cents per hour paid to workmen. There is an irreducible minimum metal content in a commercial orebody which it will pay the industtry to recognize. This metal content is such that neither an eight, nine or ten-hour day, or twenty-five or thirty-two and a half cent per hour wage will substantially alter the profit resulting therefrom.

Any vein or formation indicating ore which does not contain this minimum volume of metal, which makes it a mineable venture, is not worth bothering about under a day of any number of hours or a wage of any number of cents—within certain fixed limits. It is, therefore, not worth mining at all, and only worth a certain amount of exploration to prove its unprofitableness. The fact that many companies or individuals will mine any old orebody is no valid argument that the trained employees of an industry should be compelled to work ten hours per day or nine hours per day, or even eight hours per day, to justify the misjudgment of an operator.

Your first editorial deals largely with a letter written by the Cobalt mine managers to Mr. Price, Mining Commissioner. Before discussing this editorial more closely let us look for a moment at the eight-hour principle as applied to metal mining. This eight-hour day has been universally adopted in the Australian States. It has been adopted in many States of Western America, and in other places, and, where adopted, this statement is axiomatic: "That where the tradesmen engaged in mining are properly and systematically trained to their business and working under a systematized eight-hour day the costs of production on given orebodies are lower and the metal content recovered higher than under any other circumstance, always understanding that the human units and the mechanical units of the trade must be given certain irreducible minimum considerations in the form of fixed wages, fixed hours of work, and fixed compensation for injury." When we have appreciated this we are forced to agree with the editor of The Canadian Mining Journal when he says that in "principle the eight-hour day is sound."

In your editorial of Oct. 1st you note that the mine managers of Cobalt claim that the Cobalt miners are well paid, better, indeed, than any other mining region of Canada. This may be true, or it may not be true. Relatively, it is a matter of little importance, because mining is not concerned, primarily, with the rate of pay that miners receive, but the volume of profit that results from industrial mining. It is hard to follow the statement that miners would lose from fifty to sixty-five cents per day if the work-day be reduced to eight hours. It is not manifestly unfair for a man to demand the same remuneration for eight hours as he receives for ten. The remuneration should depend entirely upon the production per man employed.

The statement that the cost of prospecting and working unproductive claims renders the final cost of silver generally above the market value has nothing whatever to do with the exploitation of the orebody and, therefore, cannot enter into the merits or demerits of an eight-hour day. If individuals will explore ground (the result of which are doomed to failure from the outset) they cannot demand recognition from a systematized industry. Territory which has been explored and has failed to disclose profitable orebodies will, however, have to be considered, and will be a properly borne charge upon the existing profitable industry. But it cannot be accorded other labor considerations than those given to profitable territory.

Severe climatic conditions are the very best reason for considering to a great extent the human element in the industry.

The sixth point taken up by the mine managers, that underground work is not injurious to miners' health is not in accordance with established facts anywhere. Mining is not the most healthful of occupations. The powder gases, dust from machine drilling, and the other disabilities, such as water, etc., which miners are compelled constantly to work in contact with, are reasons why they should be well paid and not worked too long at any one period. Their occupation (statistics to the contrary notwithstanding) is always dangerous, hence the recognized higher rates of pay than many other callings.

The seventh reason taken up in your editorial is the real reason for an eight-hour day. Mining labor in Northern Ontario is probably not so well organized as in the Western States, and, therefore, mining is conducted not so economically as in the Western States, and, therefore, miners of Ontario are compelled to work longer hours through lack of experience in their trade and through lack of systematization in their work.

For an eight-hour day to be successful every man employed upon a mine must be thoroughly trained and thoroughly systematized as to his work. Mine managers themselves, their deputies or foremen, are those who are responsible for the proper training and selection of their workmen; the manager and engineer are the men responsible for the proper systematization of their effort. Given skill and given systematization, the eight-hour day, wherever applied in metal mining, is a more profitable day to the owner and a more humane day to the employee than any longer day still used. Generally speaking, where metal mining is conducted by a nine or ten-hour day, there is the clearest

kind of evidence that the workmen and the system under which they work are not the best obtainable. Where the eight-hour day is in existence on this continent there you will find the best-trained men of the industry, and under similar conditions you will find the cost of production and operation as low, if not lower, than elsewhere. Incompetent labour and unduly long hours produce inefficient work, with resulting loss of ore and unsafe working conditions. This is the real argument for an eight-hour day. It is easy on the manager, easier on the men, and easiest on the mine.

What possible justification is there for a man going to work when daylight is breaking and quitting work when daylight is ceasing in order to do a certain given amount of work, which can be done under proper organization in much less time? Why fiddle with the function of the astronomer and throw the hands of the clock back a certain amount each week during the winter season so that you may collect all the daylight that nature furnishes into the miners' workday? This is an admission of weakness and lack of system, and should be promptly and thoroughly abolished by all mine-owners of the province.

You fail to state, Mr. Editor, where the eight-hour day applied to metal mining has been applied unsuccessfully. Special conditions, of course, limit its profitable application. These special conditions are usually lack of orebodies. It is hard even yet to convince most operators that it is no use operating without a condition that gives hope of real orebodies. You are not only wasting your own time, but that of the workmen also.

In your editorial of Oct. 15th, I must take issue with you when you say the interests of the owners and employees are identical. The interests of the owner and employees are friendly, yet opposed. The interest of the owner is to mine profitably, and that is usually the only interest he has in the business of mining. The interest of the employee, on the other hand, is to obtain employment at this trade in order to secure a living and to obtain the highest remuneration for the shortest possible number of hours of work. Their interests, therefore, are antagonistic, except that probably the interests of the owners and employees are identical in so far that both are desirous of seeing the work well done. We are, therefore, justified in saying that the trade and professional interests of owners and employees are identical, but that their economic interests are distinctly opposed. The question then resolves itself into this: As the interests of the owners and employees are antagonistic, is it desirable (from an economic standpoint) to introduce the eight-hour day into the metal mines of Ontario? My contention is that the eight-hour day, established with well-trained men and system, will give greater output per man than a nine or ten-hour day. It is, therefore, expedient to adopt it. It will also tend to more pronounced organization, and, where organization becomes more perfect, the quality of work becomes still better. This is a second reason for its adoption.

Work has been expensive in Ontario in the past through mistakes made by operators and by ill-trained employees. None of these faults can be attributed to the eight-hour day. As you stated, Mr. Editor, that the eight-hour day is sound in principle, why not adopt it? If this proposition is sound in principle that is the greatest argument for its adoption.

You say that a fact generally overlooked is that a considerable portion of the miners do not want an eight-hour day. If you will poll the miners that are trained, intelligent tradesmen it will be found they will to a man favour the eight-hour day. Whether any other trade or industry be not as fortunately situated as mining, as to hours and rates of pay, is not the question. We are not dealing with the farmer or the shoeblack, or the tailor, but with the mining industry, and if the eight-hour day will benefit this industry and render its operations less crude, less expensive, and its profits and productions greater, then nothing should stand in the way of its adoption.

In speaking of the miner, I am also speaking of the mill-men, smelter-men and of all other persons employed in or about mines.

It is well-known to those of us who are amalgamators that no man is efficient as an amalgamator if he has to work for twelve hours per day. Companies that insist upon their employees working twelve hours per day in mills do so to their own economic disadvantage. It is useless in a letter of this kind to go into a discussion as to why this is so. This Journal is read by men trained to the industry of mining and metallurgy, and this fact must be patent to them without further discussion.

Your, etc.,

MINER.

Toronto, Oct. 24th, 1912.

THE SEMI-ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE.

(Continued from last issue.)

THE PRESIDENT'S ADDRESS.

The President, Dr. Barlow, then delivered the following address:—

"I find by the agenda which our Secretary has placed before me that I am expected to make a few remarks. Canada is a country of such enormous extent, and its interests are so varied and so widely separated that it is of vital importance that we should come together at times to discuss our common problems, if the Canadian Mining Institute is to remain as thoroughly representative and national as it is at present.

"It was mainly with this view in mind, but coupled with the cordial invitation of the British Columbia members, that we decided to hold our first semi-annual meeting in Victoria. Moreover, we realized that altogether the present time of year, although it has certain disadvantages, was really the best at which to call such a gathering. Among the several matters of Institute business which should be discussed at this meeting are the proposed amendments to the by-laws, which, on the ruling of the President at the last annual meeting, were declared out of order, owing to insufficient notice.

At the same meeting we were rather startled by the statement of the Secretary of the Western Branch that the Western members had not heard of these amendments until after their arrival in Toronto. In the circumstances, therefore, it is important that these amendments to the by-laws, which are to be presented to the next annual meeting by a representative committee, should receive careful consideration by all the members present at this gathering.

"I would like to remark on the continued prosperous condition of the mineral industry of Canada. The annual production shows a steady and very healthy increase. Although the production in certain sections in any year may be curtailed, such decrease is more than compensated by a corresponding increase in other portions of the country.

"In Nova Scotia, I regret to say that, in spite of repeated attempts to rehabilitate gold mining, the industry continues to decline, and I very much doubt if we can hope in the near future for any large revenue from this source to swell the annual production. The decrease in gold mining, however, serves in a measure to direct attention to the large increase in the production of coal, which this year will be the largest in the history of the province.

"New Brunswick has not yet attained to an important position as a mineral-producing province, although there is promise of the establishment of an iron industry of substantial proportions in the Bathurst District. The oil and gas found near Moncton will soon be utilized to build up a large industrial centre at that place.

"The Province of Quebec shows a steady and substantial increase in mineral products. In 1899 the value of these amounted to $2,585,635, while in 1911 this value has increased to $9,087,698, or 251.5 per cent., a proportional progress only exceeded by that of Ontario in a similar period (334.5 per cent.). The recent very large addition to the territory of Quebec, most of which is underlaid by rocks of pre-Canadian age, gives promise of much larger proportional increase. Until lately Quebec comprised an area of 352,000 square miles. This area, in May, 1912, was more than 706,834 square miles by the addition of Ungava. Only a very small proportion of this territory has been explored by prospectors. In spite of over-capitalization and over-production in the asbestos industry of Quebec, the shipments in 1911 were higher than in 1910, although the quantity of rock mined was 13.10 per cent. less in 1911 than in 1910. A proportion of the shipments was drawn from stocks in hand. In 1910, 80,605 tons were shipped, valued at $2,667,829, while in 1911 this amount had increased to 102,224 tons, valued at $3,026,306. The balance between output and shipment is slowly readjusting itself, so that there is a notable improvement in the asbestos situation. Quebec now contributes more than 75 per cent. of the world's total production of asbestos. Quebec has also the unique distinction of having the deepest copper mine in Canada, the Eustis Mine being now down nearly 3,000 feet on the slope. The copper situation is improved, too, by the addition of the McDonald Mine at Weedon to the list of shippers. This mine is now producing at the rate of over 2,000 tons per month of ore, which averages over 42 per cent. of sulphur and 5 per cent. of copper, with negligible quantities of gold and silver.

"Ontario has now taken her place as premier province in mining of the Dominion, having passed British Columbia about three years ago,. The production, which, in 1909, amounted to $32,981,375, grew to $39,313,895 in 1910, and $42,672,904 in 1911. If this same rate of growth is maintained the value of the mineral production for 1912 will be over $45,000,000. For the twelve years, ending in 1911, the proportional increase has been 334.5 per cent., while in the same period British Columbia shows an increase of 67.9 per cent., and the whole Dominion of Canada 107.7 per cent. With the recent addition of the District of Patricia, containing 157,400 square miles, Ontario now has an area of 407,262 square miles. The geology of the District of Patricia presents about the same features as does that of the region hitherto known as Northern Ontario, being underlain mainly with rocks of the pre-Cambrian age. Public attention has been directed to Ontario as a mining province for many years past, and ample capital has been provided, mainly by private effort, for its intelligent exploration and prospecting. Nowhere in Canada are there so many or more intelligent and resourceful prospectors, so that the great area of hitherto unprospected country is receiving capable examination. It seems certain, therefore, that Ontario must, in these circumstances, hold her position as the foremost mining province for many years to come.

"In Alberta the development of the coal industry in recent years has been astonishingly rapid. The progress this year is being more than maintained. The future may perhaps be better appreciated when we learn that Mr. D. B. Dowling of the Geological Survey estimates that the mineable coal of the Central Plains and the Eastern Rocky Mountains, explored with some accuracy, amounts to 130,400,000,000tons.

"In British Columbia the extension of the railway systems and the building of new lines has rendered a large additional territory accessible to the prospector. This extension of readily explorable country is sure to have a stimulating effect on the mineral industry of the province. The discovery and preliminary development of the Groundhog Coal Basin already presages a large and valuable new anthracite field, while the opening up of the Granby Copper Company's property on Observatory Inlet will be followed shortly by the erection of a smelter at that place in the near future.

"In connection with the progress of our industry, may I add before closing, a few words of appreciation of the work the Geological Survey of Canada. At our last annual meeting in Toronto there was a rather regrettable occurrence when a mining engineer of repute questioned the value of much of the geological work carried on in Canada. The incident only tended to accentuate, if there was need, the close interdependence of geology and mining. Some universities, notably Wisconsin, with a full cognizance of such a close relationship, have so fashioned a course that they train mining engineers, who are at the same time very capable geologists. I am happy to be able to say that the Canadian Mining Institute of late years has recognized the disinterestedness of geologists, for I am the third geologist in succession to be elected to the Presidency by the mining men of Canada. The Geological Survey is doing, and has done, a vast amount of work, which has been of the greatest assistance to mining. Its present director, Mr. R. W. Brock, is a man who has devoted many years of his life to the study and practice of geology in its relation to mining. His presence here with a number of the staff of the Geological Survey is evidence of the continued and great interest of geologists in mining. In British Columbia, the Geological

urvey are spending more money and doing more work ian in all the rest of Canada. Mr. Brock will doubtss explain to you that British Columbia is the best iining ground in the Dominion, since geology is here ien in its three dimensions. The principles and exiaples of structure, so well illustrated in the developents of the majestic mountains, are thus more readily iscernible and more easily understood in British olumbia and Western Alberta than, perhaps, elsehere in Canada. All credit, therefore, to the Geologi-l Survey, which for many years has done such alous, disinterested and capable work in assisting the ining industry of Canada. It has sometimes been isunderstood or misrepresented, but withal it is held high esteem by the mining community.

"I may also appropriately refer here to the Internaonal Geological Congress, which meets in Canada in ugust of next year (1913). Part of the duty that rought me to the West this year was that I might ssist in the arrangement of a Western excursion on e main line of the Canadian Pacific Railway. The siting geologists will come from all parts of the world here geology is taught and practiced. It will perhaps e the greatest opportunity for legitimate advertising the natural resources of Canada that has ever been forded. We are using every endeavour to make the ssions in Toronto, as well as the excursions before id after the sessions, unqualifiedly successful. Later i I will ak Mr. Brock, who is the General Secretary, go more fully into the details, as we wish to enlist ie sympathy and co-operation of all the mining men s well as of the geologists throughout Canada, in the rangements.

"In conclusion, our presence at this meeting, at the usiest season of the year, is a sufficient evidence of ur conviction of the value of the Institute to the minig profession. The Canadian Mining Institute is a ioroughly national and representative body. In the Vest the progress of the Institute is very gratifying, hile in Ontario, Quebec and Nova Scotia we have a ery large and enthusiastic membership. The discusons at the meetings of the various branches are very istructive, at the same time affording an opportunity or the interchange of friendly greetings and courtesies. would again express myself as being much gratified hat I have the honour of presiding at this, the first emi-annual meeting in British Columbia. I had hoped or a larger gathering, but what it has lacked in numers has been more than compensated by the evident nterest of those present in the proceedings."

General Business.

Among matters brought forward for discussion were he proposed amendments to Sections 33, 34 and 35 of he By-laws. These amendments, originally introduced y Mr. W. F. Ferrier at the last annual meeting in 'oronto, were there submitted for consideration to a horoughly representative committee and with minor hanges endorsed by them, final action by the Institute eing, however, deferred for another year. The Secreary explained the reasons, which, in the opinion of nany members, rendered the proposed changes desir-.ble, adding that advantage had been taken of the resent occasion to afford Western members the opporunity to express themselves on the subject should they lesire to do so.

Federal Department of Mines.

In calling attention to the fact that under present arrangements the mining industry was not adequately represented in the Federal Cabinet, the Secretary briefly surveyed the conditions that led to the creation of a Department of Mines at Ottawa. The establishment of this department was almost entirely due to the representations of the Institute, whose efforts, however, were only partially successful until some five years ago, when an Act was finally passed establishing a Department of Mines. It was placed under the ministerial direction of Mr. Templeman, a gentleman whose long residence in the West had after given him a considerable knowledge of the requirements of the mining industry. Unfortunately, as it has turned out (for it has created a precedent), Mr. Templeman held the dual office of Minister of Mines and Minister of Inland Revenue. The administrative duties appertaining to the latter department are relatively light, and Mr. Templeman, during the time he was in office was occupied mainly in directing and administrating the affairs of the Mines Department. With the change of Government, a gentleman not possessing Mr. Templeman's special qualifications, received the portfolios of Inland Revenue and of Mines. Later a change was made, the Mines' Department being transferred to the Department of the Interior, whose Minister is already overburdened and whose duties are multifarious. There is no branch of the Government service in greater need of organization and ministerial control than the Department of Mines, while under the guidance of a responsible Minister the efficiency of the department could unquestionably be greatly increased. In reference to Mr. Templeman's remark that the Government may not consider it politic or expedient to make any further additions to the Cabinet, the suggestion has been offered that it would not only be possible, but advantageous, to combine certain of the ministerial offices. For example, Inland Revenue could properly be included with Trade and Commerce, while a Department of Natural Resources, embracing mining, forestry, water powers, etc., would serve a most excellent purpose.

Mr. Jacobs considered that every effort should be made to secure for the mining industry that representation and consideration its importance warranted.

Mr. L. O. Armstrong remarked that he was greatly interested in the suggestion that there should be a Dominion Department of Natural Resources. The Canadian Pacific Railway Company had established such a department with the best possible results.

After some further discussion, in which the President and Mr. W. J. Sutton participated, a resolution, moved by the latter gentleman and seconded by Mr. Charles Graham, was carried unanimously, expressing the sense of the meeting that in the interests of the mining industry of the Dominion it was eminently desirable the Federal Department of Mines should be administered by a Minister of the Crown, whose attention would be mainly directed to the performance of the duties appertaining to this office.

Afternoon Session.

In the afternoon, Dr. Barlow delivered an interesting lecture, illustrated with lantern slides, on the geology and mineral resources of Northern Quebec and Ontario. The discussion that followed covered a wide range, and occupied the greater part of the session. In reply to one enquiry, Dr. Barlow stated that during 1911 the Cobalt District produced 14 per cent. of the world's supply of silver, and thus was responsible for placing Canada in the third position among the silver-production countries of the globe. The total output of silver from the camp to the close of 1911 represented $64.918,-752, of which nearly one half had been distributed in

the form of dividends. Of the thirty mines regularly productive in 1911, eighteen had paid dividends. In respect of Porcupine, he was given to understand that the year's production, dating from the commencement of crushing operations, would not fall short of a valuation of two million dollars.

The afternoon's programme concluded with an account given by Mr. R. W. Brock of the arrangements that had been made in connection with the visit to Canada next year of geologists attending the International Congress, of which Mr. Brock is the General Secretary. He also invited the co-operation of Western members to ensure the success of excursions to Western Canada.

Evening Session.

At this session a paper was presented by Mr. E. Jacobs, dealing generally with the copper mining industry of British Columbia. Some excellent slides were thrown on the screen, illustrating methods of mining in the several districts, and of the principal metallurgical works. The industry is in a more flourishing condition than at any previous time, and the author directed attention in particular to the important new developments at Granby Bay, Observatory Inlet, and remarked on the satisfactory progress now being made in the development of the Britannia Mine, at Howe Sound.

Thursday Morning Session.

The first paper presented was one by Mr. F. Napier Denison, dealing with the subject of the relation of earthquakes to colliery explosions. In the course of his remarks he stated he was firmly convinced that a direct connection could be established between slow earth records that had been kept this connection appeared to have beeen established. In the case of colliery disasters in Great Britain, covering a definite period, it was demonstrated that 67 per cent. of the disasters occurred within twenty-four hours of the occurrence of earthquakes. In the United States the percentage was found to represent 46 per cent.

Mr. Denison then exhibited the seismograph, designed by himself, for recording earth movements in mines, and demonstrated its operation. One such instrument has been placed underground, at a depth of 979 feet, and another at the surface in one of the mines of the Western Fuel Company at Nanaimo.

Mr. Shallcross remarked that Mr. Denison's investigations had created much attentions, and the Victoria Board of Trade considered the matter to be of sufficient importance to justify them in urging the Dominion Government to provide the funds necessary to further the work in question.

Mr. Sutton stated that from a practical mining standpoint the investigations were of value. Vancouver Island is in the seismic zone of the Pacific Coast, and it is well known that earth movements have been frequent here in recent geologic times. Hence the opportunities were particularly favourable for the conduct of investigations of this character. "We have," he added, "extensive coal mines on the island, and it certainly appears that there is a sympathetic relationship between earth strains and the outbursts of large volumes of gas. For this reason I consider it highly important that the Government should establish a well-equipped seismoligical station on this coast."

Mr. Mortimer-Lamb expressed the opinion that Mr. Denison might advantageously seek the co-operation of the Department of Mines at Ottawa in establishing the correctness of his theory. If, he said, Mr. Denison was able to conclusively demonstrate that there was a definite relationship between earth movements and explosions, and if, as has been advanced, there are certain periods or cycles when earth movements are known to be more frequent than at others, it would appear that these investigations might be turned to very practical account.

Mr. Denison stated that he welcomed the proposal and a resolution was accordingly adopted by which the Secretary was requested to bring the matter to the attention of the Director of Mines, with the suggestion that, if practicable, seismographs be placed in all mines throughout Canada, and that the department ascertain and determine in what further directions research may be carried, having particular regard to the practical application of Mr. Denison's theory.

Mr. D. B. Dowling then read a paper, "Fuel Problems of the Pacific," originally presented by Mr. H. Foster Bain at the annual meeting of the Institute. This was productive of an interesting discussion. Mr. Dowling remarked that the trade of the Pacific slope was at present in its infancy, and it was difficult to estimate the direction in which it might be expected to develop. Although, as Mr. Bain had suggested, the great liners would doubtless burn oil as fuel in future, the majority of the freight-carrying steamers would continue to burn coal, for the reason that oil was not readily obtainable at ports other than those on this coast.

Mr. Lamb remarked that it was possible to conceive of great industrial developments in Western Canada in the next few years. Mr. Bain's paper should be read in conjunction with a paper contributed to the Institute by Mr. Allan Greenwell, in which the author shows that manufacturing invariably goes to fuel rather than coal to manufacturing. The opening of the Panama Canal would undoubtedly affect the industrial conditions of the world. It would open new trade routes, and perhaps divert trade into altogether new channels. Mr. Bain emphasized more particularly possible developments in connection with fuel supply for ships; but the chief hope for Western Canada was the utilization of her immense coal resources in establishing manufacturing industries and in bringing in raw material from outside to be manufactured in this country. Of course, before this could be accomplished many difficulties would have to be surmounted. The high cost of labour, as at present obtaining, would be a very serious handicap; but, it must be remembered that existing conditions in this respect in the West are abnormal, and their adjustment is only a matter of time. Mr. Lamb also referred to the industrial awakening of China, and of the effect it might presently have on the trade of the world.

Mr. Shallcrosss, referring to the probable influence of the opening of the Panama Canal on freight rates on the Pacific Coast, remarked that the present distance to Europe is about fifteen thousand miles. With the opening of the canal the distance will be reduced to about seven thousand miles. This must necessarily have its effect in the saving of time alone, for, whereas, by the Suez route, it requires ninety days to draw supplies from Europe, the time occupied by way of Panama will be about forty days. More important, ohwever, is the probable effect on transportation between the Pacific and Atlantic coasts. The average rate on ada will also be affected. At present the cost of the journey, via Montreal, is very high. The journey by way of Panama will not only be much less costly, but more convenient. This then should influence greatly

eight, which is now 90c. per 100 pounds. This will be ıt in two. Immigration from Europe to Western Can- ːe movement of Europeans to the Western coast of ıis continent. Mr. Shallcross also spoke on the im- ɔrtance of developing an oil industry in Western Can- la. He remarked that there were undoubtedly im- ortant indications of oil in certain districts of both ritish Coolumbia and Alberta, and urged that special eps be taken by the Government to prove the exist- nce of oil in quantity.

Mr. Dowling called attention to experiments con- ucted by the Department of Mines, at Ottawa, having egard to the economical production of power from ɔw-grade coal, and stated it had been demonstrated hat power produced from lignite in a gas producer ras at least as cheap as power produced from the burn- ıg of oil.

Mr. Sutton pointed out that in addition to immense oal resources, potential and developed, the water pow- rs of the West were of great economic value. He dded that at the Cumberland mines, ten per cent of he coal had, to the present, been consumed at the vorks for power purposes. It was now proposed to ave this percentage of the output by utilizing a water ɔower in the vicinity.

At the suggestion of Mr. Jacobs, Mr. Chas. Camsell gave some information concerning the oil-bearing rocks of the MacKenzie Basin. The exposures here cover an ırea of more than three hundred square miles. In the .ower part of the basin, where the rocks are exposed, ɔil comes to the surface in numerous localities, especi- ılly on the north shore of Great Slave Lake, and again down the MacKenzie Valley towards the Arctic circle. In the delta of the MacKenzie River, oil-bearing rocks are exposed with bituminous matter exuding. In reply to Mr. Lamb, Mr. Camsell stated that no areas had been acquired by capital in this field, although boring was undertaken some years ago, and natural gas encoun- tered, but so far as he knew, no oil.

Speaking of the competition of California oil with British Columbia coal, Mr. Thos. Graham, Chief In- spector of Mines, remarked that properly there should, under the tariff requirements, be a duty on this oil upon its entering Canada, since its flash test was above the standard required for free entry.

The Duty on Rescue Apparatus.

Mr. Thomas Graham suggested that the Institute should apply to the Dominion Government for the re- moval of the duty on rescue apparatus for use in mines. The Western Branch some time ago had made an ap- lication to the authorities in this respect, and had been assured that action would be taken accordingly; but nothing had been done. Meanwhile coal mining com- panies are importing apparatus, and, although the duty is evidently refunded on application, the companies are subjected to annoyance and trouble of an official cor- respondence, to an extent often not commensurate with the amount of money envolved.

The Secretary stated that during the past two years the Council had made repeated representations to the Government to this effect. An application was made to the Minister of Customs last spring, and resulted in a lengthy correspondence. The Minister was informed that life-saving apparatus for use other than in mines was admitted duty free; that mining machinery not manufactured in Canada was also on the free list, and a ruling was asked that mine rescue apparatus be placed in one of these categories. The department had replied that in order to comply with the request it would be necessary to pass special legislation, but ad- vised that the attention of the Tariff Commission be directed to the anomaly. The Commission has not yet been appointed, but the Council had no intention of allowing the matter to drop. On motion of Mr. Jacobs, votes of thanks were then tendered to the Victoria Board of Trade, for having placed their rooms at the disposal of the Institute, and to the local press for cour- tesies and attention. The secretary also took the op- portunity of speaking appreciatively of Mr. Jacobs' services to the Institute, and remarked that he was greatly indebted to Mr. Jacobs for his assistance in connection with the present meeting.

The traditions of the Institute were worthily up- held at the dinner in the evening.

FRANK MEETING

The adjourned meeting was held in the Sanitarium Hotel, at Frank, on September 30th. In addition to the officers of the Institute there were present: Messrs. Lewis Stockett, Calgary; D. G. Wilson, Hosmer; John Shanks, Coal Creek, B.C.; Leonard C. Stevens, Burmis; Andrew A. Millar, Blairmore; R. W. Coulthard, Cal- gary. Evan Evans, Fernie, B.C.; E. Gheur, Toronto; J. Menard, Blairmore; S. A. Jones, Lethbridge; S. Shone, Bellevue; Robt. Hamilton, Redcliff; A. N. Scott, Cal- gary; O. E. S. Whiteside, Coleman; W. F. McNeill, Calgary; A. Rotteleur, Frank; J. Bilteryst, Blairmore; W. A. Davidson, Coleman; R. H. Morris, Pocahontas; W. R. Wilson, Fernie; R. Livingtone, Lethbridge. John Brown, Hillcrest; J. D. Thomas, Passburg; W. L. Hamilton, Medicine Hat; W. Hutchinson, Hillcrest; D. A. McAulay, Coleman; Raoul Greene, Blairmore; L. P. Robert, Blairmore; and John T. Stirling, Edmonton.

The morning session was devoted almost exclusively to general business. As in Victoria, the proposed amend- ments to the by-laws were explained and discussed, and resolutions were adopted similarly worded to those passed at the Victoria meeting, urging the Dominion Government to appoint a Minister of Mines for Canada and provide for the free entry of mine rescue apparatus. The organization of a local branch of the Institute for Southern Alberta was also considered, the concensus of opinion being, however, that the branch should be re- presentative of the coal mining industry of both Southern Alberta and Southeastern British Columbia. It was consequently decided to organize with this in- tention, and the branch will be known as the Rocky Mountain Branch of the Institute. Mr. W. R. Wilson, general manager of the Crow's Nest Pass Coal Com- pany, by a unanimous vote, was elected Chairman; Mr. J. T. Sterling, Provincial Inspector of Mines of Edmonton, Secretary; while Mr. O. E. S. Whiteside, of Coleman; Mr. W. F. McNeill, Mr. R. W. Couthard, and Mr. Lewis Stockett, of Calgary, and Mr. Robert Living- stone, of Lethbridge, were elected to serve with the Chairman and Secretary as an Executive Committee. In the course of the morning Mr. Mortimer Lamb gave a brief history of the Institute, and referred to its ac- tivities and aims.

AFTERNOON SESSION.

Four papers were presented and discussed at the afternoon session, the first by Mr. W. D. L. Hardie (read by Mr. Coulthard) on the subject of "Engineers' Reports on Mines," created much interest. The author emphasized the point that the value of any report was entirely dependent on the application of scientific methods of valuation. He advocated that in making valuations, both "remunerative and accumulative in-

terest on the investment should be taken into consideration," and quoted freely from King's Theory of Finance in support of his contention. In the discussion that followed it was urged that engineers should make a practice of publicly protesting on each and every occasion when their views were misrepresented in consequence of the very common plan adopted by promoters of merely publishing extracts, without the context, of a report. A case was cited where an actually adverse report had been successfully employed by this means to extract money from the public.

Another interesting paper, productive of much discussion, was that by Mr. W. F. McNeill on "Provincial Mining Legislation," in which such matters as Workmen's Compensation and the Eight-Hour Law were considered. The present law in Alberta in respect to the former was criticized, but it was decided to discuss the issues raised at greater length at the meeting of the branch to be held in Lethbridge in November.

Mr. R. H. Morris, general manager of the Jasper Park Collieries, gave an interesting account of the development and equipment of these mines. As Mr. Whiteside remarked, operators in the southern fields of the province are quite ignorant of the progress of coal mining in northern country, and he and others expressed astonishment at learning that so much had been accomplished in the very limited time stated. Mr. R. W. Wilson, who had visited this field, remarked that the geological features at Jasper Park and its vicinity were somewhat unusual, and he thought might well be made the subject of a supplementary paper to the Institute. Mr. Morris thereupon undertook to prepare some notes and drawings for presentation at a subsequent meeting. Another paper dealing with an important engineering undertaking in the northern field was also read, but as the information was supplied without the authorization of the general manager, substance cannot at present be given.

Before the close of the proceedings, a vote of thanks, on motion of Mr. Whiteside, was tendered the President and the Secretary, "who had travelled so great a distance and had gone to so much pains to provide for a meeting of the Institute in Alberta; and which had resulted in the organization of a branch which it was hoped and believed would serve a most useful purpose."

The Secretary in reply said that as a paid official he was in no sense deserving of or entitled to special thanks, but in the case of men such as the President, who ungrudgingly sacrificed time and money to the service of the Institute, it was right and fitting they should be accorded full recognition and gratitude. The high standing and usefulness of the Institute was entirely due to the disinterested zeal and the unselfish devotion of individual members, not exclusively restricted to those who had or were holding office. The success of the present meeting was in a very large measure attributable to the efforts of the convener, Mr. Stirling, and to the co-operation of the members of the local committee, and he begged to move a vote of thanks to these gentlemen. Mr. Barlow said, that although chairman of the meeting, he would be glad to be permitted to second this motion.

This concluded the first meeting of the Institute in Alberta. There will be many in future, no doubt, no less enthusiastic and representative; and with the rapid growth of the coal mining industry in that province, there is reason to believe that before long the Institute's membership here will at least equal that of any of the older centres.

THE SULPHURIC ACID INDUSTRY IN THE UNITED STATES*

By Utley Wedge.

To arrive at a broad understanding of the sulphuric acid industry in the United States, it is necessary to consider it in its relation to the great industries which require the production of sulphuric acid.

The greatest of these lines of manufacture which require sulphuric acid, are as follows, and opposite each is noted an approximation of the quantity of sulphuric acid consumed in that industry. Figures given are in terms of tons of 50 deg. Bé sulphuric acid per annum:

	Tons.
Manufacture of fertilizer	2,400,000
Refining in petroleum products	300,000
Used in iron and steel and coke industry	200,000
Manufacture of nitrocellulose, nitro-glycerine, celluloid, etc.	150,000
Manufacture of aluminum sulphate and the different alums, sulphates of magnesium and similar salts, carbon dioxide and hydrogen, sulphide gas, aniline and other organic dyes and colors, hydrochloric, nitric, hydrofluoric, chromic boracic, acetic, picric and other acids, either, glucose, blue vitriol, zinc sulphates, and in the metallurgy of copper, gold and silver and general chemical practice	200.000
Total	$3.250.000

In the manufacture of phosphatic fertilizer, phosphate rock is treated with sulphuric acid to render the phosphoric acid soluble. One ton of rock phosphate requires treatment with about one ton of 50 deg. Bé sulphuric acid.

In refining petroleum products, sulphuric acid 66 deg. Bé and sometimes fuming acid is used for the removal of tarry matter and to some extent sulphur compounds. For example, one thousand barrels of illuminating oil requires for its refining about two tons of oil of vitriol.

In the iron and steel industry, very dilute sulphuric acid, free from arsenic, is used for cleansing steel plates or wire preliminary to galvanizing, making copperas as a by-product; also the steel companies have gone extensively into the production of coke with by-product coke ovens, one of the products of which is sulphate of ammonia, which requires a little over a long ton of 50 deg. Bé sulphuric acid for each net ton of sulphate of ammonia produced.

*Paper presented at the Eighth International Congress of Applied Chemistry, New York, September, 1912.

In the manufacture of nitrocellulose, nitro-glycerine, c., highly concentrated or contact sulphuric acid is sed in connection with strong nitric acid to absorb ater formed during nitration which would otherwise iterfere with the chemical action desired.

In the manufacture of alum, either bauxite or white lumina, are treated with 50 deg. Bé sulphuric acid, ee from arsenic, to form aluminum sulphate.

In the manufacture of sulphate of ammonia, ammonia as is absorbed in scrubbing towers by dilute sulphuric cid or solutions of ammonia are treated direct with ılphuric acid.

In the manufacture of blue vitriol, metallic copper is issolved by hot sulphuric acid, very dilute. Dilute ılphuric acid is also used to some extent in leaching opper ores, concentrates or slimes for the recovery of opper values.

No attempt is made to give a complete category of ie uses of sulphuric acid, but enough has been speci- ed to show the distribution of line of manufacture hich require sulphuric acid.

Phosphate rock deposits are in Florida, Tennessee, nd South Carolina. There are also deposits of phos- hate rock in Utah and elsewhere in the Western States, hich will have great industrial importance as soon as ie demand for phosphatic fertilizer in the West has rown to a point to justify the erection of fertilizer lants.

The location of fertilizer plants is decided by the ollowing facts:

The phosphate rock has, in any event, either acidu- ıted or not acidulated, to be transported from phos- hate deposit to agricultural district where it will be onsumed. The complete fertilizers can be manufac- ured near the point where the fertilizer will be used. herefore, a determining factor in the location of phos- hatic fertilizer works is the freight on sulphuric acid r crude material from which it is manufactured.

One ton of pyrites containing 50 per cent. sulphur vill produce 2.35 tons of 50 deg. Bé sulphuric acid, so hat it is cheaper to transport iron pyrites than to ransport the quantity of 50 deg. Bé sulphuric acid vhich a given amount of iron pyrites would produce.

Sulphuric acid plants in connection with fertilizer lants are therefore generally located adjacent to the gricultural district where the fertilizer will be con- umed and not near the deposit of phosphate rock, and ombined sulphuric acid and fertilizer plants located ıear phosphate rock deposits are there merely to sup- ly agricultural requirements in that vicinity. Com- ined sulphuric acid and fertilizer works are therefore ocated in parts of the United States where phosphatic ertilizer is required.

Fertilizer is extensively used in connection with the growing of cotton, and the Southern States, denoted ıs cotton growing States, contain very numerous sul- huric acid plants.

In the Northern and Eastern States, the use of phos- hatic fertilizer is not so extensive and a less number of combined sulphuric acid and fertilizer plants supply he demand.

The consumption of fertilizer, other than in the Western States, is growing so enormously that a most ınusual business situation is developing, and even in Jtah combined sulphuric acid and fertilizer plants are ıow contemplated.

Much the greater portion of sulphuric acid produced n the United States is made from iron pyrites.

During 1911, pyrites was supplied from the following ountries:

	Net tons.
Spain	815,000
Portugal	133,000
United States, Canada, about	350,000
Total	1,208,000

Of this amount 584,000 net tons were delivered to plants in the South manufacturing sulphuric acid exclusively for the production of fertilizer, and 236,000 net tons were delivered to plants in the North manufacturing sulphuric acid exclusively for the production of fertilizer.

These quantities of pyrites would represent a production of sulphuric acid in the fertilizer plants in the Southern States of about 1,300,000 tons of 50 deg. Bé sulphuric acid, to which should be added 275,000 tons of 50 deg. Bé sulphuric acid produced as a by-product by the copper smelters in Tennessee, practically all of which is consumed in the manufacture of fertilizer in the Southern States.

The 236,000 tons of pyrites delivered to plants in the Northern States, manufacturing sulphuric acid exclusively for the production of fertilizer, would represent 529,000 tons of 50 deg. Bé sulphuric acid.

In addition to the above fertilizer-acid, considerable quantities of sulphuric acid are manufactured in works doing a general chemical business and shipped to fertilizer works for treatment of phosphate rock, also sulphuric acid separated from sludge acid from petroleum refineries is shipped in considerable quantities to fertilizer works, bringing the consumption of sulphuric acid in the fertilizer business up to the total figures given above.

In the petroleum industry the consumption of sulphuric acid has increased slowly for some years, for the reason that the oil refiners have learned to economize in sulphuric acid and have decreased the quantity used per barrel in refining to largely offset the large increase in the production of petroleum products. For example, previous to 1888 in many oil refineries sulphuric acid was mixed and stirred with distillate only once, being then at once diluted and separated from the combined tarry matter and again concentrated to 66 deg. Bé before using again in the oil refining process. In 1890 the practice came into general use of using sulphuric acid a second time, taking the acid from a previous treatment of distillate and using the partially exhausted acid on a second batch of distillate before separating and concentrating. This materially reduced the consumption of fresh acid. Again, about the year 1896, the use of Fuller's earth was introduced in oil refining practice. Tarry matter was removed from distillate by agitation with Fuller's earth and a decreased amount of work remained to be done by sulphuric acid treatment. These two improvements made a material reduction in the use of sulphuric acid in oil refining. Subsequent improvements in method and practice in recovering sulphuric acid from sludge or spent acid have further reduced the net consumption of fresh sulphuric acid by the petroleum industry.

The location of acid plants supplying oil refineries is quite uniformly adjacent to the oil refineries on account of the transportation problem.

Transportation of crude oil by pipe line is so much cheaper than the transportation of refined products by rail, that oil refineries under conditions in the United States are located with reference to transportation and distributing of the refined product and seldom adjacent to oil producing fields, except only to supply the demand for the finished product in the radius of economic

shipment from the oil fields. The great oil refineries are, therefore, chiefly located where there is both rail and water transportation. There are oil fields in Pennsylvania, Ohio, Indiana, West Virginia, Indian Territory, Texas, California and some other States. The large oil refineries, however, are located along the Atlantic seaboard on the water front near New York harbour, Philadelphia and Baltimore; along the Great Lakes at Buffalo, Cleveland and near Chicago; on the Pacific coast, on San Francisco Bay. Minor oil refineries are located near the oil fields. In every case sulphuric acid plants are located near the oil refineries. The group near New York are supplied from a large chamber-process sulphuric acid plant on New York harbour, operated by the petroleum refining interest, with an output of about 60,000 tons of oil of vitriol per annum. Oil refineries at Philadelphia and Baltimore are supplied with oil of vitriol from a sulphuric acid plant at Philadelphia delivering about 40,000 tons of oil of vitriol per annum. The California crude oil requires treatment in part with an acid stronger than oil of vitriol, which is supplied from an oxide-of-iron-contact plant at the oil refinery, on San Francisco Bay.

One small refinery adjacent to the Texas oil fields burns brimstone from the Louisiana sulphur deposit.

In many cases, the oil refineries or chemical companies supplying them with sulphuric acid are equipped with appliances for separating sulphuric acid from the tarry matter taken up in the treatment of petroleum distillate and the separated acid of 35 deg. Bé and 50 deg. Bé is then again concentrated to 66 deg Bé for further use. This repeated restoring of the spent acid greatly diminishes the amount of fresh sulphuric acid required by the petroleum industry and brings their net requirements down to the figure given above.

Mention should also be made of a practice by the petroleum refiners to a very limited extent of manufacturing sulphuric acid from sulphuretted hydrogen and sulphur dioxide fumes given off during the distillation of petroleums high in sulphur contents. In general, it may be said that the fresh sulphuric acid consumption by the petroleum refining companies represents chiefly the actual decomposition of a percentage of the sulphuric acid used by reduction to SO_2 by the carbon in the oil treated, plus deliveries of separated sulphuric acid 50 deg. Bé gravity to fertilizer plants. In addition to the mechanical loss in use, there is actual decomposition to SO_2 during treatment, especially of heavy oils, and also the decomposition is considerable in the process of separating and reconcentrating the sulphuric acid.

Counting the repeated use of sulphuric acid by the petroleum industry, their actual use of oil of vitriol would be about 334,000 tons per annum, representing 500,000 tons of 50 deg. Bé equivalent.

The iron and steel industry uses such considerable amounts of sulphuric acid that a tendency is developing for steel companies to erect and operate separate sulphuric acid plants.

The manufacture of sulphate of ammonia from by-product coke ovens has also been taken up by the steel companies. A coke plant consuming 2,000 tons of coal per day would produce from 14 to 30 tons of sulphate of ammonia daily, according to the nitrogen content of the coal used. Therefore, each 2,000 tons of coal, high in nitrogen, converted into coke daily, would call for a sulphuric acid production of 10,000 tons of 50 deg. Bé sulphuric acid per annum.

The location of sulphuric acid plants to supply this demand has so far been adjacent to the steel plants in Pennsylvania, Indiana, Michigan, and Alabama.

By-product coke ovens are now being built or under consideration which will require 100,000 to 150,000 tons of 50 deg. Bé sulphuric acid per annum, in addition to the figure shown above. This development has so far been chiefly in connection with iron and steel industry.

One of the sulphuric acid plants operated by one of the steel companies burns brimstone from Louisiana, the other burn pyrites. All so far constructed have been chamber-plants, although one by-product plant now being built has contracted for its supply of sulphuric acid from a concern producing contact acid.

In the manufacture of nitrocellulose, nitro-glycerine and similar products, the chamber process has been practically eliminated by the contact process. Contact process has been installed wherever these explosives are manufactured. Several iron-oxide contact plants have been erected for this purpose as well as other contact systems.

In the general chemical industry, the various platinum and iron contact systems have made considerable progress, more especially where the demand is for sulphuric acid approaching the composition of the monohydrate.

Out of a total production of sulphuric acid in the United States of 3,250,000 net tons per annum, approximately ten per cent. is contact acid made either by the iron-oxide contact or by the platinum contact systems.

Of the Spanish pyrites imported during 1911, namely, 815,000 tons, 37 per cent. was copper bearing pyrites, of which about 200,000 tons were chloridized and leached for the recovery of copper values, after burning off the sulphur for the manufacture of sulphuric acid.

Of the 646,000 tons of iron pyrites imported during 1911 containing no copper values, about 230,000 tons was washed fines from which copper had been leached in Spain or Portugal before shipment to this country.

The practice of nodulizing cinder from pyrites burners has become general in all localities where there is a market for the nodulized cinder as iron ore. The iron industry of Pennsylvania furnishes a good market. In Alabama the iron manufacturers have not as yet offered prices for low phosphorus nodulizing kilns and there is in the South the accumulated cinder from years of sulphuric acid manufacture, waiting for prices which will make its utilization profitable.

An analysis of the source of sulphuric acid manufactured in the United States during 1911 would show as follows, figures given being expressed in terms of 50 deg. Bé sulphuric acid:

	Tons
Manufactured from pyrites	2,665,000
Manufactured from blast furnaces, smelting copper sulphide ores	275,000
Manufactured from zinc sulphide ores	285,000
Manufactured from brimstone	25,000
Total	3,250,000

ACTION OF ALUMINA IN COPPER SLAGS.

The subject of the behaviour of alumina in copper lags has of late been given much attention at the melting works of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, British Colmbia, and while we have not yet arrived at any denite conclusion in regard to its behaviour, we have vorked out a formula which gives very satisfactory esults in our case.

Taking an average monthly slag with the following omposition:

FeO	SiO_2	CaO	MgO	Al_2O_3
16.1	44.0	19.2	2.5	17.4

1) Figuring alumina as acid oxygen ratio is 1:3.14
2) Figuring alumina as base oxygen ratio is 1:1.28
3) Figuring alumina as neutral oxygen ratio is 1:2.33

It will be seen that in case (1) we have an impossible lag, in case (2) a slag which appears too basic, judging rom the appearance of our slag here, and case (3) is lightly on the acid side.

In our calculation we assume that the CaO present ombines with the requisite amount of Al_2O_3 to form he silicate of lime and alumina with the composition Al_2C_3, 3 CaO, 6 SiO_2, this alumina acting, of course, as base and any excess over the amount required for his formula will act as an acid.

Figuring the above slag on this basis, we have:

	Per cent.	Units O.
SiO_2	44.0	23.47
Al_2O_3	17.4	8.17
CaO	19.2	5.49
FeO	16.1	3.57
MgO	2.5	1.00

Leaving one oxygen equivalent of Al_2O_3 to one of CaO on the basic side and moving the balance of the Al_2O_3 oxygen to the acid side we have:

	Acid.		Base.
SiO_2	23.47	CaO	5.49
Al_2O_3	2.68	Al_2O_3	5.49
	26.15	FeO	3.57
		MgO	1.00
			15.55

which gives ratio base to acid 1:1.68, a good economic slag.

Figuring all the slags mentioned in Mr. Bellinger's article, on this basis the result is a good practical slag in each instance and similar results have been obtained from calculations on many other slags which have come under our notice.

Our experience here is that the amount of alumina acting as a base is determined by the amount of lime present in the slag and the addition or substraction of lime to or from the charge beyond certain narrow limits proves this to be the case.

It is quite probable that some other bases may act in the same capacity as lime.

[Editor's Note.—On August 15 the Journal published some information relative to the action of alumina in the formation of copper slags, as given by Mr. H. C. Bellinger, general manager of the Great Cobar, New South Wales, in his presidential address before the Australasian Institute of Mining Engineers, who spoke of his own experience with Rossland ores, among others. The following notes are by Messrs. Jas. Buchanan and F. E. Lee, of Trail, B.C., here Mr. Buchanan is superintendent of the Consolidated Company's big smelting works.]

NOTES ON GRANBY COMPANY MATTERS.

In its notice of the annual report of the Granby Consolidated Company, the "Boston Commercial" of October 5 made a serious mistake concerning the quantity of ore developed and shipped last year at the company's mines at Phoenix, B.C. As the account of the "Commercial" has since been reprinted in British Columbia, it is desirable that a correction be made. The part of the account that is erroneous follows: "During the year the company developed 14,408,000 tons of ore and shipped 7,975,000 tons, making the amount of ore now in sight 6,433,418 tons, which is slightly more than the amount in sight at the beginning of the year." The facts are that in all years, from the time the company commenced smelting on August 21st, 1900, to the end of the fiscal year ended June 30th, last, an aggregate of 7,944,373 tons of ore from the Granby mines at Phoenix had been smelted. At the close of the fiscal year ended June 30th, 1911, the quantity of ore "estimated in sight," according to the report for that year, was 6,720,267 tons. It would appear that the company now claims that the quantity of developed ore in its mines at Phoenix was, on June 30th, last, 6,433,418 tons, or about 287,000 tons less than at the corresponding period of 1911, after having shipped about 722,000 tons to its smeltery during the last fiscal year.

In its notice of the Granby Company's last annual report, the "Mining and Engineering World, of Chicago, observes: "One of the most important features of the report is the data given on ore reserves. No new ore bodies have been developed at the Phoenix property, but previously-known orebodies have been further extended The total reserves are placed at 6,433,418 tons, as against 6,420,267 tons for the previous year, showing that more ore was developed than extracted. During the year just closed 721,719 tons of Granby ore was smelted. The average value of the 6,433,418 tons now in reserve is not given." Passing over as of minor importance, the discrepancy of 300,000 tons in the figures for the quantity of ore in sight on June 30th, 1911, as respectively stated by the journal just quoted and in the company's printed report for 1911, the following information as to average value of the ore may be of interest. The printed annual report of the company for the year ended June 30th, 1910, contains full information relative to the then estimated ore reserves as arrived at by Mr. O. B. Smith, Jr., the company's chief mining engineer and superintendent of mines, and Dr. Otto Sussman, of New York, the expert, whose report on the property occasioned so much concern in 1910. Mr. Smith's conclusions as to ore reserves are contained in the following brief excerpt from his report: "Tons of ore remaining blocked out, 6,429,-169. Estimated value per ton of ore blocked out: Copper, 1.25 per cent.; gold, 0.043 oz.; silver, 0.250 oz. In regard to the amount of ore which will be lost in the course of mining, in pillars, loose muck, etc., I can judge only from past experience in stopes which are nearly worked out. We hope to mine and ship 90 per cent. of all the ore developed. In some places we will be able to do better than this, but in others we will not be able to hold to the average." Allowing ten per cent. loss in mining, Mr. Smith's estimate of recoverable ore at that time was 5,786,253 tons. Dr. Sussman reported: "The total amount of recoverable ore in the property is approximately 5,595,000 tons, averaging copper 1.24 per cent., silver 0.25 oz., and gold 0.04 oz. per ton." It will be seen that these estimates are practically in agreement, the difference in quantity of recoverable ore being only 191,253 tons, and in metal contents only

fractional. Further, Dr. Sussman allowed for a recovery, (that is, 1.24 per cent. less smelting loss in slag) of 19 lbs. of copper to the ton of ore; while a table recently published in the "Boston Commercial" shows the actual recovery of metals per ton of ore to have been—for year ended June 30th, 1911, copper 18.13 lbs., silver 0.37 oz., gold 0.42 oz., and for year ended June 30th, 1912, copper 18.39 lbs., silver 0.29 oz., gold 0.043 oz. The quantity of Granby ore smelted in the former year was 959,563 tons, and in the latter, 721,719 tons, together 1,681,282 tons. If the average recovery shown is for Granby ore only, these figures would seem to indicate that the estimates of average value first above given are being fairly well realized.

SOME GRANBY FIGURES.

Occasionally it is stated by men interested in copper mining in British Columbia that they are unable to find reliable statistical information that will enable them to get an intelligent idea of the results of copper mining and smelting in the province. On October 5th, the "Boston Commercial" printed tables giving many figures showing the financial aspect of the Granby Company's operations during nine years, 1904-1912, and other particulars of quantity of ore smelted, average recovery of metals per ton, and total metal production in each year of the twelve fiscal years—ended on June 30th, 1911, and on to 1912—the Granby Company has been producing and smelting ore. Much of the information relative to production of ore and metals, down to the year ended June 30, 1910, inclusive—was printed in the company's annual report for the last mentioned year, but the "Commercial" has added the figures for the last two years as well.

While the tables of figures that follow do not comprise the whole of the information contained in those printed by the "Boston Commercial," they give the most useful particulars concerning production of ore and metals, and financial results of operations.

Ore Smelted.

Year ended June 30.	Granby. Tons.	Customs. Tons.	Total Tons.
1901	169,087	7,832	176.919
1902	293,645	7,455	301,100
1903	289,583	13,914	303,497
1904	516,059	40,472	556.531
1905	550738	39,382	590.120
1906	796,188	36,158	832.346
1907	649,022	16,893	665.915
1908	858,432	24.179	882.611
1909	964,789	19,944	984.733
1910	1,175,548	21,829	1,197,377
1911	959,563	24,783	984.346
1912	721,719	17.800	739.519
Totals	7,944,373	270.641	8,215,014

The next table gives production of metals from the quantities of ore shown in the foregoing table:

Year ended June 30.	Copper, pounds.	Silver, ounces.	Gold, ounces.
1901	5,435,955	34,900	8,871
1902	10,836,851	274,511	30.786
1903	12,551,758	277.574	35.121
1904	16,020,986	275,935	54.493
1905	14,244,692	215.449	42.980
1906	19,939.004	316.947	50.020
1907	16,410,576	201,337	32.738
1908	21,092.288	300,204	40.068
1909	21.901.528	335.520	45.760
1910	22,754,899	356,746	48,752
1911	17,855,130	343.504	41,744
1912	13,231.121	225.305	33.932
Totals	192,254,788	3,158,022	465.265

RECOVERY OF METALS AND COST PER TON.

The quantities of metals recovered per ton of ore are for "dry tons shipped" each year. As the yearly tonnages differ a little from those shown in the first above-printed table (there is not room in this column to show the exact figures here) calculations will not work out correctly. As, however, the difference between the respective totals of all years is less than 8.000 tons, the discrepancies are too small to seriously affect the proportions of metals per ton here shown, as under:

Year ended June 30.	Copper, pounds.	Silver. ounces.	Gold, ounces.	Cost per ton.
1901	31.49	0.4406	0.1003	$4.77
1902	27.23	0.2952	0.0808	4.08
1903	24.58	0.2772	0.0717	3.75
1904	22.87	0.2819	0.0608	3.35
1905	24.68	0.2688	0.0599	3.14
1906	24.30	0.3107	0.0513	2.87
1907	24.43	0.3038	0.0503	3.28
1908	23.42	0.2865	0.0454	3.11
1909	21.90	0.2730	0.0435	2.85
1910	18.70	0.2281	0.0370	2.50
1911	18.13	0.37	0.042	2.77
1912	18.39	0.29	0.043	2.90

Note.—The cost per ton is not inclusive of cost of marketing blister copper.

RECEIPTS AND EXPENDITURES.

The amounts realized from sale of metals produced during nine years 1904-1912, the yearly expenditures, and the net amounts realized, are shown in the next following table:

Year ended June 30.	Gross receipts.	Expenditures.	Net earnings.
1904	$2,966.347	$2.682.833	$283.514
1905	2.749.145	2.036.496	712.649
1906	4,751.059	3.927.442	1.823.617
1907	4,521,549	2,596.612	1.924.937
1908	3.790.184	3.183.662	606.522
1909	3,983.537	3.302.402	681.135
1910	4.009.925	3,534.978	564.947
1911	3,216.014	2.999.489	216.525
1912	2.874.760	2.291.381	583.379
Totals	$32,952,520	$25,555,295	$7,397,225

PLACER GOLD ON MEULE CREEK, SEIGNIORY OF RIGAUD-VAUDREUIL, QUEBEC.

Abstract of Report by Joseph Keele in Summary Report of the Geological Survey.

Introduction.

Placer gold mining was carried on in the Chaudiere iver valley during many years, the most active period f mining operations being included between the years 863 to 1878. The Chaudiere River is a northwesterly-owing tributary of the St. Lawrence, heading near the uebec-Maine boundary and joining the St. Lawrence ot far above Quebec City. The gold-bearing territory, nown as the Beauce gold district, borders the middle iird of the river valley. Some of the ground was very ich, the Gilbert River, one of the principal tributaries f the Chaudiere, for example, yielded nearly $2.000,000 1 coarse gold in a distance of 2 miles, the gold being aken out principally by open-cut work. Much of the round in the district though it carried good pay could ot be profitably worked by individual miners, on ccount of the great thickness of over-burden lying on ed-rock—where mostly all the gold was found—the resence of underground water, and the large size of he boulders frequently encountered in the workings. Iining operations, however, were carried on until 896, but were mostly unprofitable during this later eriod.

Recently a Montreal syndicate operating under the ame of the Champs d'Or cie Rigaud-Vaudreuil, have cquired the mining rights on the territory known as he seigniory of Rigaud-Vaudreuil, comprising an area f 70.000 acres, and covering a great portion of the haudiere valley and its tributaries, including Gilbert River. Prospecting was begun early in 1910 on Gilbert River, River des Plantes, Bras River, and Meule Creek, sing Keystone and Empire drills for piercing the ravels. As the prospects and water supply were avourable on Meule Creek, the work of installing an ydraulic plant was begun there during the winter of 910-11.

Only a few days were spent by the writer in this field, o that the following descriptions are incomplete.

Geographical and Geological Sketch.

The region that includes the gold fields is a dissected plateau lying northeast of the more hilly portion of outhern Quebec, and has a general elevation of 1,200 o 1,500 feet above sea level.

The Chaudiere River traverses the region in a northwesterly direction; it occupies a valley of considerable limensions, and carries the drainage of the gold district nto the St. Lawrence River, its mouth being about 8 niles above the City of Quebec.

The valley is underlain principally by grey and reddish Ordovician slates. These slates are penetrated by narrow bands of basic igneous rocks, which recur at ntervals of one-half to 1 mile.

The wider part of these valley occur where the comparatively soft slates have been eroded by the river, and the contractions are formed where the harder gneous bands project as spurs from each side of the valley walls. The valley is apparently an ancient one, as the river for the greater portion of its course flows without change in grade over hard and soft rocks alike. A mantle of unconsolidated material principally of glacial origin, is nearly everywhere present.

The valley of the Chaudiere is rather thickly settled, and all the bottom lands and much of the side slopes are cultivated. Fairly extensive tracts of mixed timber still exist in the small tributary valleys, and on the upland, a quantity of pulp wood being produced annually from them.

The Quebec Central Railway crosses the valley of the Chaudiere at Valley Junction, situated 43 miles southeast of Levis, the railway's terminal point on the St. Lawrence. A branch line of this railway extends up the valley of the Chaudiere from Valley Junction for a distance of 56 miles.

The only mining now being done is on Meule Creek, a tributary of Mill River, which enters the Chaudiere opposite the village of Beauceville, 12 miles south of Valley Junction.

The prevailing bed-rock seen in the creeks is composed of dark grey or red slates of Ordovician age. The cleavage of the slates is the most pronounced structure of these rocks, and is parallel to the bedding planes. The beds are also traversed, irregularly, by numerous joint planes at various angles to the cleavage. On weathering, the rock breaks down into thin slabs, wedge-shaped fragments, and splinters.

The slates have been disturbed from their original attitude, and the beds are now in a vertical position.

The slate bed-rock is penetrated at intervals by dyke-like sheets of diabase of 100 feet in width or more. These intrusive sheets may have originally been injected as sills between beds of the sediments while the latter were in their original horizontal position, the whole being subsequently dislocated until the formation stood on edge, and the intrusive sheets assumed the appearance of dykes. Enclosed within the diabase sheets are bands of quartz porphyry or porphyrite, of irregular width. Whether the porphyrite originated from the same magma as the diabase, or has subsequently eaten its way up through it, could not be determined without more extended observations. Both the diabase and porphyrite have schistose phases, and show considerable alteration in places.

Veins, stringers and kidneys of quartz are often locally abundant in the intrusive bodies, but are by no means a persistent feature in them. In certain parts of the district quartz veins are found traversing the slates and other sediments.

A mantle of unconsolidated material, principally of glacial origin, is spread nearly continuously over the region. The thickest deposits of boulder clay appear to occur in the narrow valleys of the tributary streams, while terraces of alluvial sand, gravel and clay border the main river.

Pre-glacial deposits of sand, gravel and clay, overlying the bedrock, are still preserved on some of the side streams. These pre-glacial beds are of no great thickness, they are overlain by thick deposits of glacial drift, and their presence is only revealed during mining operations.

Mining.

Meule Creek is a small stream flowing in a narrow valley of rather steep grade, with heavily timbered side slopes. The gold is mostly all found on bedrock.

so that mining operation involve the removal of the overlying materials, and the hydraulic method is here used for moving these alluviums.

The workings in August, 1911, consisted of an open pit, made on the right limit of the creek, about half a mile above its junction with Mill River. At the time of the writer's visit, the operations preliminary to a clean-up were being made after a month of hydraulicking. The plant in use is the first of its kind to be installed in this gold field, so that the results obtained from it are awaited with great interest.

Water for the monitors is obtained from Lake Fortin, a sheet of water which measures one and one-half miles by three-fourths of a mile in its extreme dimensions. A ditch nearly seven miles long, of which distance about 4,500 feet is flumed, brings the water to a penstock, from which starts a riveted steel pipe 18 inches in diameter, tapering to 15 inches. At a distance of 1,400 feet from the penstock this pipe branches into 10-inch lines, each 500 feet long, terminating in monitors or giants. One of these giants is used for cutting down the bank of gravel, and the other for driving the gravel through the sluice to the elevator pit, the fall from the penstock to the monitors being 260 feet.

The sluice leading from the hydraulic pit is about 100 feet long, and about three feet wide, and is floored with steel rails laid longitudinally.

At the end of the sluice a bucket elevator, equipped with a stacker, has been installed to handle the tailings and to save whatever gold was not caught in the sluice.

The tailings are raised 40 feet by the chain of buckets, each of which has a capacity of $1\frac{1}{2}$ cubic feet. The buckets deliver the tailings into an elevated sluice, and the material is driven through it and stacked by a powerful stream of water supplied by a centrifugal pump electrically driven, having a capacity of 6,000 gallons a minute. Power is supplied from a steam power house built near the railway station at Beauceville; it is transmitted to the field of operations by a copper transmission line 8,000 feet long, at a voltage of 2,200, which is reduced by a transformer to 440 volts.

Many large boulders, too heavy to be moved by the giant, become concentrated in the bottom of the pit as hydraulicking proceeds. These are moved to one side and piled with a derrick, the power for this purpose being supplied by a Pelton wheel driven by a water jet.

The timbering of a shaft and drift are revealed at the bottom of the bank at the upstream end of the hydraulic pit. These are the remains of the old workings of Coupal, who operated here on a small scale in 1896.

The overburden is heavy on the south side of the pit as the bank rises on this side and forms the lower part of the valley slope. The section revealed in this bank consists of one to four feet of yellow gravel and clay lying on bedrock; above this and showing a fairly distinct unconformity with it is 25 feet of blue boulder clay. Above the boulder clay is 10 feet or so of slide material, which is an unsorted mass of loamy clay, gravel and rock fragments which has crept down the valley slopes.

The yellow gravel lying on bedrock is composed chiefly of fragments of slate and diabase mostly angular, but with some well-rounded pebbles; this material is all in small pieces, none being over six to eight inches in diameter, and all derived from the drainage basin of the creek. These gravels are mixed with a highly plastic, smooth, yellow clay, which is very different in colour and texture to any other clay found in the vicinity, either in the boulder clay or the later stratified clay of the river terraces.

These yellow gravels are probably remnants of preglacial or Tertiary accumulations, which, owing to their protected position in the bottom of narrow stream channels, escaped total destruction by the advancing ice-sheet during glacial times.

The boulder clay, which is the direct glacial contribution to the drift, is a mixture of pebbles, chiefly well worn and smooth, of diabase, porphyry, slate, granite, gneiss, and occasional fragments of serpentine. Boulders and blocks up to three and four feet in diameter are encountered in this deposit, the whole being bonded by a very compact gritty clay. Portions of this deposit do not break down very readily under the stream from the giant and have to be blasted.

The bedrock surface exposed in the bottom of the pit shows the greater part to be dark grey slates of rather fresh appearance, having their cleavage running in the same direction as the flow stream. The slate is well-jointed in a direction across the flow of the stream, but the principal crevices to a depth of a foot or two.

There is a portion of a band of diabase and porphyrite, partly decomposed and crumbling, exposed along the north side of the pit; it forms a tighter bedrock than the slate, and does not allow the gold to penetrate so far.

The bedrock surface, where cleared up, is very uneven, ridges of the harder parts standing up a foot or so above the more weathered portions. The yellow clay was found to have been forced into the larger crevices and had to be removed by hand-picking, as, owing to its smooth and sticky qualities, the stream from the giant was unable to tear it out.

The hydraulic pit measured about 200 feet long by 100 feet wide, and the area of bedrock cleaned up after one month's hydraulicking was about 17,000 square feet. Of this area about one-third was said to have been worked out by Coupal, leaving an area of virgin ground amounting to 11,300 square feet.

The amount of gold recovered from this area is reported to be $7,500, or an equivalent of about 70 cents to the square foot of bedrock. The amount of dirt moved amounted to 16,600 cubic yards, which would give 45 cents to the cubic yard.

The yellow gravels are said to contain some gold, but there is no doubt that the greater portion is on bedrock, so that it is obvious that the less overburden to be removed, the more profitable the mining operations.

The black sand resulting from the final washing of the gold consists mostly of grains of magnetite. The quantity of fine gold carried over into these concentrates is so large that it might be worth while to install a small magnetic separator for its recovery.

Origin of the Gold

The gold so far found on Meule Creek is all coarse, and varies in size from nuggets worth $150 to grains the size of the head of a pin, but a considerable portion is about the size of flaxseed.

The gold is very smooth; many of the particles are flattened and show signs of wear by prolonged attrition. There are a few rough pieces of gold, some with quartz still adhering to them, but these can be explained on the assumption that they had not been long enough released from a quartz fragment to become worn smooth.

The well-worn appearance of the gold is generally supposed to indicate that it had traveled from some

stant source, and had suffered much abrasion from being transported by water in company with the usual lluvial material, but this, however, is not always the ase with placer gold, as it may have a local source and ill present this warn appearance.

The origin of the gold is obscure, as it seems to have o connection with the bedrock on which it lies Locally the slates contain small cubes of iron pyrite, but o mineralization was observed in the intrusive portions. A large number of assays made from the quartz veins and intrusive rocks of this district, in former years, gave only small quantities of gold or none at all.

Owing to its gravity, coarse gold soon drops out of the current and remains behind, while every particle of the rocks which originally contained it is eventually carried away.

The horizontal movement of gold lying in bedrock is the creviced slates of Meule Creek is very small, the vertical downward movement as erosion proceeds is the principal one.

The gold while passing downward during the various stages of erosion becomes pinched and flattened in bedrocks cracks, is subjected to all manner of abrasion from the ash gravels, and is probably found now at not more than a few thousand feet in a horizontal direction from its source. But during this time it may also have traveled 1,000 feet or more in a vertical direction, which would be the principal factor in giving the gold the well-worn appearance which it now presents.

Prospecting.

In future operations in this field a considerable portion of the mining costs are to be charged up against prospecting, as the old reports on the district indicate that the ground is "spotted," or, in other words, that the "leads" or paystreaks are not continuous.

If the gold originated in veins in the intrusive rocks, and if the rich veins were bunched in certain parts of the intrusive, while the greater part of it was barren, then the breaking down of such rocks would give rise to spotted ground. If the gold originated in these intrusive rocks, then the most probable places to repay prospecting would be on the downstream side of these rocks.

The bottoms of the narrow valleys of the tributary streams generally contain the richest concentrations of gold on account of the restricted area in which the gold accumulates.

There is a prevalent opinion that the valley bottom of the Chaudiere must contain considerable gold, but this has not been proven, as the few shafts sunk there did not reach bedrock on account of too much underground water.

The side streams do not contribute very much to the gold values in the main rivers, and in many cases the paystreaks on the tributaries do not reach down the main valley at all.

All the gold that is liable to be in the main river valley may be restricted to whatever that stream itself has broken down from quartz veins which is traversed in its course.

The amount of gold-bearing veins broken down would probably be much more than those of the side streams, but the area of bedrock over which the gold would be distributed in the main valley would be large.

Very little gold, only amounting to a few fine colours to the pan, is found in the boulder clay. The paystreak in any stream in the district, if it existed, was always found on bedrock below a variable thickness of yellow gravel and clay, which are pre-glacial.

The extent and distribution of the yellow gravels throughout the region is unknown. Since they are always covered with a varying thickness of loose overburden, of a widely different character, their presence is only revealed in mining operations or by borings. So far they have always been found resting an bedrock, and in some cases they are actually composed of fragments of weathered and rotted bedrock in situ.

They are generallyregarded as being of pre-glacial age for the following reasons: (1) They contain no material having a source outside the drainage basin in which they occur; (2) no foreign material has been found underlying them. (3) they are overlain and sharply divided from deposits of glacial drift, or later stream gravels largely derived from the drift.

During some of the earlier prospecting in this field, the glacial drift was found resting on bedrock, and, when this occurred, the gold was either absent or did not occur in paying quantities.

Whenever prospecting is carried on by means of the Keystone drill, the yellow gravel may be used as a guide. If hard rock is encountered, without having pierced the yellow gravels, it may probably prove to be a large boulder, and it would then be advisable to move the drill a short distance away.

No benches or rims of bedrock at a higher elevation than the present streams, and carrying gold-bearing gravels have ever been located. Mr. Wm. P. Lockwood, who spent thirty years in prospecting over a great portion of this district, is of the opinion that no high-level, gold-bearing gravels exist here.

It may be noted in this connection that remnants of old channels or terraces at high levels on the valley slopes would suffer from erosion during glacial times, and that the gold in the boulder clay may be derived from that source.

Dredging in the wide flats at the mouths of tributary streams is proposed for this district. Before commencing operations of this kind, the ground should be thoroughly prospected with an Empire or other similar make of drill. The principal obstacles to the success of dredging here, will be the presence of large boulders, and the difficulty of recovering a great deal of the gold, if present, from the deeply-creviced bedrock.

THE CADEBY MINE EXPLOSION.

Written for the Canadian Mining Journal.

The explosion which occurred on July 9th in the Cadeby pit, near Conisborough, South Yorkshire, had a melancholy interest for many in the mining districts of Cape Breton, as a number of miners have migrated from this district to various parts of Canada, and to Sape Breton in particular. The tragic part of this explosion was that more men were killed in the rescue parties than in the initial explosion, including three of the mines inspectorate, among them being Mr. W. H. Pickering, than whom a truer and braver gentleman never gave his life for his fellows. The disaster arose from the ignition of a gaseous mixture by a gob-fire, and the most surprising feature is not that the explosion should have occurred, but that during twenty years of fighting gob-fires this should have been the first serious disaster. Considering the fiery nature of many of the South Yorkshire mines, particularly those working the Barnsley bed on the eastern limits of the field, where the coal is reached at great depths, the district has been singularly immune from serious explosions, a fact

which in itself is a tribute to the precautionary measures commonly employed in the collieries of the English Midlands.

The recovery of the bodies of those killed in the various explosions has been attended with great difficulty, and has once more, in the most telling manner, shown the utility of oxygen breathing apparatus. It was found impossible to recover some of the bodies because of the fire existing in that section of the mine where the explosion originated, and in order to extinguish the fire the section was sealed off and inert gases were forced in—a mixture of nitrogen and carbon-dioxide.

For several weeks relays of men wearing Draeger apparatus have been working in the irrespirable atmosphere endeavoring to recover the bodies still in the mine. The process has been a slow and a laborious one, and attended by conditions of a most nauseating character. The apparatus corps could advance only by stages as it was necessary to construct air-locks so that the sealing of the affected area would not be interfered with. The work was attended by one unfortunate accident, in which a member of one of the apparatus corps displaced his mouth-tube and was immediately suffocated, and, at the same time, the remaining members of the party were placed in grave danger and were rescued by another party only just in time. It is evident from the proceedings at the inquest that the man who lost his life was upset and overcome by nausea by suddenly coming across a dead body. By some means, not quite clear, the unfortunate man's mouth-tube slipped out of his mouth, and before his comrades could reach him his teeth were tightly clenched and could not be opened. From the evidence of other members of the party it is clear that the sudden encounter with the dead body drove him delirious, and that he lost control of himself altogether.

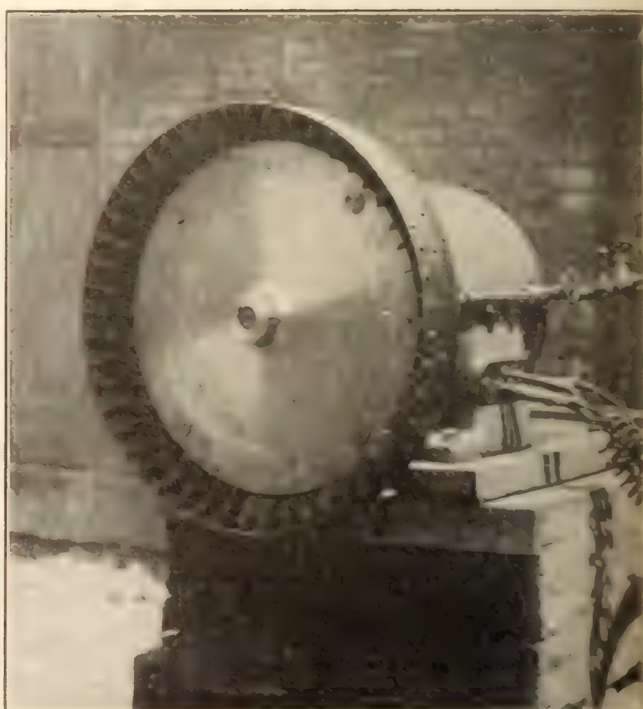
The remarks of the Coroner in closing his enquiry are worthy of reproduction. After referring the services of the jury, the Coroner remarked: "He had further to allude to the services of the rescue parties. Where all men had been engaged in the work of rescue it was impossible to particularize, but he considered that the search party who recovered the bodies had done even more heroic service than the brave men who rushed down the mine immediately after the explosions had occurred. They all knew that sudden danger called forth indomitable heroism, that kind of heroism which he thought deserved the most notice. The men engaged in this work knew that there was no possibility of saving human life, but only to collect bodies. That had been a work which had not called forth much enthusiasm, but he did consider that all those teams, most of them strangers to the mine—because unfortunately the local men perished—had rendered a service which was invaluable. The apparatus which had been demonstrated before them was only in its infancy, and he had no doubt, that men in the future would be able to enter foul air and rescue their fellow-workmen free of all danger to themselves. The thanks of the whole community were due to these men for carrying out their difficult and dangerous work. No one who had not seen the condition of the bodies could realize the repulsive work they had had to do."

When it is considered that for weeks at a stretch relays of trained men have been working in an atmosphere so deadly as to cause immediate death to those who breathed it, engaged in the most unpleasant task that can be allotted to men, there is little need to enlarge upon the lessons to be learnt. One fact, however, should never be forgotten, that mine rescue work with oxygen-breathing apparatus is no work for amateurs or weaklings. Men must be rigidly trained, their apparatus must be in perfect and reliable condition, and thorough discipline and obedience to rules must be enforced. Oxygen-breathing apparatus will not enable men to do foolhardy or impossible things, and improperly used it becomes rather a source of danger than otherwise. But that these devices can be of incalculable benefit in time of emergency can no longer be doubted. As one mine manager remarked: "You may never need apparatus, but when you do need it, you need it bad." Mere provision of the apparatus, however, without training and proper supervision is suicidal and simply an invitation to disastrous accident.

A NEW TYPE OF MINE AIR HUMIDIFIER.

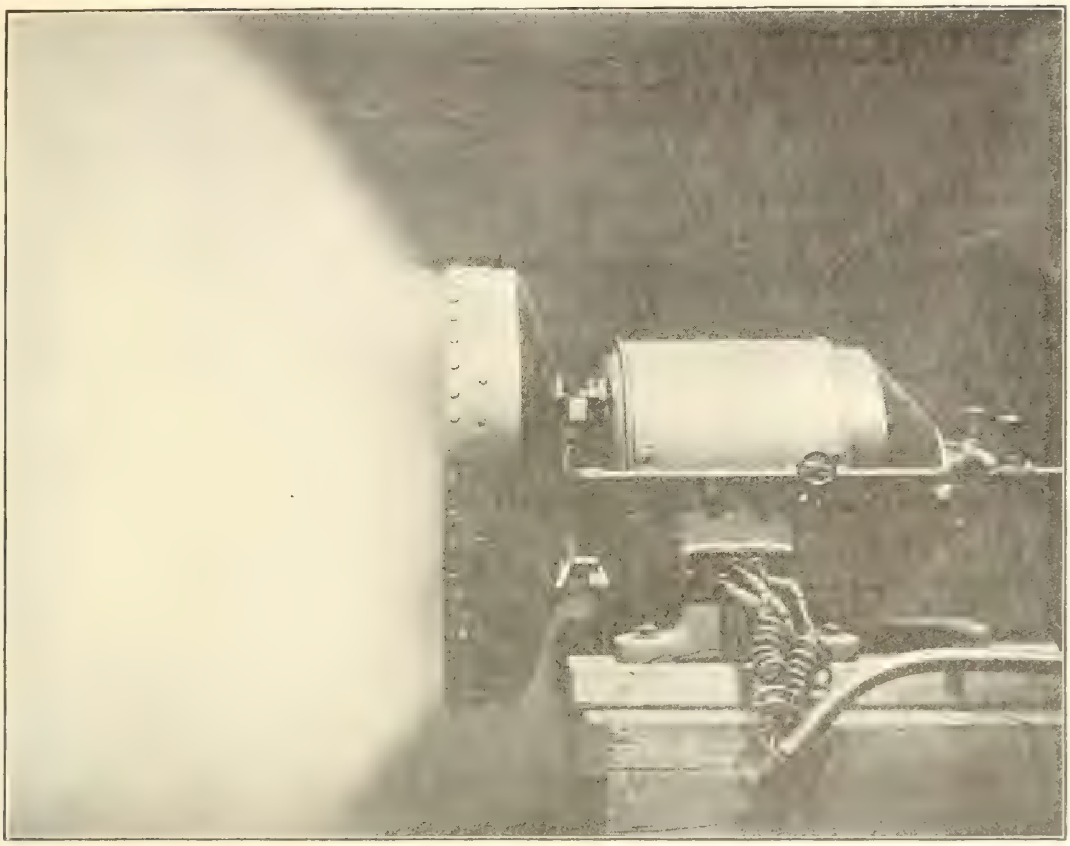
The United States Bureau of Mines has on exhibit at its Pittsburg testing station, a machine for producing water mist that is almost fine enough to be termed a fog.

As shown in photographs 1, 2 and 3, the machine consists of a hollow wheel mounted upon the shaft of an electric motor. The wheel is provided at its periphery with spray nozzles, at its hub with an opening



Centrifugal Humidifier, showing improvements. Front View.

for the admission of water, and on its back with fan blades. The back and rim of the wheel is enclosed in a steel housing that serves as a casing for the fan, as a support for the air diffusion vanes, and as a shield for the revolving parts. When the wheel is rotated at normal speed by the motor, and water is admitted (under practically no pressure) to the opening in the hub centrifugal force develops, at the nozzles in the wheel's



Centrifugal Humidifier in action, discharging 1.65 gallons of water per minute, showing the appearance of the mist as it leaves the humidifier.

riphery, an hydraulic pressure of more than 200 unds per square inch. This pressure drives the water rough the nozzles in the form of a fine spray which seized, broken up still more, and finally carried away the blast of air that the fan blades on the back of e wheel blow out all around the rim of the wheel be- een it and the surrounding housing. The diffusion vanes cause the air to be discharged in the form of a cylinder whose axis is coincident with the fan shaft.

The mist produced is extremely fine and there is practically no dripping of solid water. The device which was developed by H. H. Clark, one of the bureau's engineers, is not yet in its final form, and has not yet been tested in actual practice.

PERSONAL AND GENERAL

Mr. C. L. Cantley, of New Glasgow, N.S., was in ontreal last week.

Mr. Charles MacNutt, of Casilla, Antofasgasta, Chili, in Montreal. Mr. MacNutt has been a member of e Canadian Mining Institute for a number of years.

The Australian Mining Standard announces that Mr. . C. Bellinger, general manager of the Great Cobar, td., and formerly associated with undertakings in ritish Columbia, is about to take a four months' holi- ay, and will spend a part of that time in England. ur contemporary adds that Mr. Bellinger, as general anager of the greatest copper producer of the Com- onwealth, has achieved an unquestionable success. e has not had by any means an easy task to accom- ish, for besides the mining and metallurgical prob- ms he has been called upon to solve, he has had to al with labour difficulties that were far from incon- derable.

Capt. T. L. Angel, for many years with the De Beers ompany, at Kimberley, as mechanical engineer, has ar- ved in Canada and proposes to practice his profes- on in this country.

Mr. A. B. Willmott, consulting engineer of Toronto, as returned from a trip to the Eastern Townships where he examined a pyrites property for American clients.

Mr. James Ashworth, Vancouver, B.C., recently completed several examinations of coal properties in Alberta and Saskatchewan.

The address of Mr. G. M. Colvocoresses, formerly of Gowganda, Ontario, is now Room 1407, 43, Exchange place, New York city.

Mr. David H. Browne, of Copper Cliff, recently delivered an interesting address before the Undergraduates Society of Applied Science of McGill University on the subject of the early history of the Canadian Copper Company.

While examining a property near Ottawa the other day, Mr. J. Beidelman, consulting mining engineer of Montreal, was severely injured from falling down an 18-foot shaft.

In its issue of October 26th, The Engineering and Mining World published an appreciative article on the work of Dr. Reginald A. Daly, who, as we announced some months ago, has been appointed to the head of the Geological Department of Harvard University, filling the Sturgis-Hopper Chair, in succession to Professor Davis. Our contemporary remarks, "the position

is probably the highest obtainable on this continent in geological work, and is a life appointment." Dr. Daly is a native of Napanee, Ontario, and was a member of the staff of the Geological Survey of Canada from 1902 to 1907.

Mr. T. J. Flynn, jr., formerly of Colorado and Porcupine, has been appointed the Canadian agent for the Taylor Engineering & Manufacturing Company, of New York.

Mr. Walter C. Adams, who graduated from McGill University in 1894, and has been mining in Mexico for the past ten or twelve years, is visiting Montreal and may spend the winter in that city.

Mr. C. P. Hill has returned to Montreal from British Columbia.

Mr. Charles Fergie has returned from the West.

Mr. J. W. Evans, of Belleville, was in Montreal on business last week.

Mr. G. C. Bateman, of the Canadian Mining and Exploration Co., Limited, Toronto, was in British Columbia last month.

Dr. J. Macintosh Bell was in the Kootenay and Similkameen districts, British Columbia, at the end of October. He went thence to the Coast cities, Vancouver and Victoria. He was accompanied by Mr. Gwynn G. Gibbons.

Mr. Frederick K. Brunton, metallurgical engineer, formerly assistant engineer of tests for the Anaconda Copper Co., Anaconda, Montana, U.S.A., has been appointed assistant superintendent at the British Columbia Copper Co.'s smeltery at Greenwood, B.C.

Mr. Marius R. Campbell, geologist in charge, economic geology of fuels, U.S. Geological Survey, and Mr. W. Nelson Page, have been examining coal properties on Graham island of the Queen Charlottle group, British Columbia.

Mr. Herbert Carmichael, provincial assayer, Victoria, B.C., left that city during the latter part of October on a trip to Mexico.

Mr. Robt. Clark, who had been in charge of the work of driving a long low-level adit at the Payne mine, in Slocan district, B.C., was seriously injured by an explosion of gelignite. It is feared he will lose the sight of both eyes, beside being otherwise disfigured

Mr. Graham Cruickshank, of the engineering staff of the Consolidated Mining and Smelting Company of Canada, Ltd., has been conducting experiments in connection with the reduction of lead-zinc ores, at the Canada Zinc Co.'s electro-thermic zinc smeltery at Nelson, B.C.

Mr. H. E. Dodge, who for years had been accountant at the smeltery offices of Consolidated Mining and Smelting Co., of Canada, Ltd., recently left Trail, B.C., for New York, where he will be chief accountant for the several companies with which Mr. W. H. Aldridge, formerly managing director for the Consolidated Company, is now prominently connected.

Mr. Colin Fraser, mining geologist, of London, England, formerly chief geologist for the Geological Survey of New Zealand, is in British Columbia, after having visited mines in Cobalt district, Ontario.

Mr. John Hopp, the largest operator of hydraulic placer-gold mines in Cariboo district, B.C., has been visiting Victoria and Seattle at the close of the gravel-washing season in Cariboo district.

Mr. Sidney J. Jennings, of Boston (United States Smelting and Refining Co.); Mr. D. D. Muir, jr., of Seattle, Washington; and Mr. L. O. Kellogg, of Tacoma, Washington, have been examining the Standard silver-lead mine, near Silverton, Slocan lake, B.C.

Mr. A. G. Larson, has returned to Vancouver, B.C., after having examined for a London company several mining properties on Moresby island of the Queen Charlotte group. He was assisted by Messrs. G. H. Dickson and B. Kirk.

Mr. Douglas Lay, superintendent of the Van-Roi mine, near Silverton, B.C., has returned to his post after having been absent about three months on a trip to England.

Mr. J. Ralph Lockard, formerly of Pittsburg, Pennsylvania, is now general superintendent of the several coal mines of the Canadian Collieries (Dunsmuir), Ltd., in Cumberland district, Vancouver island, B.C.

Mr. C. O. Mailloux has been appointed assistant to the president of the Granby Consolidated Mining, Smelting, and Power Co., Ltd. Mr. William H. Nichols, New York, is now president, having last month succeeded Mr. G. M. Luther, who retired owing to ill-health, and the new president has been given an assistant, as above-mentioned.

Mr. T. L. McAllister, superintendent of the Noble Five group of mines, near Cody, Slocan, B.C., has been on a visit to Victoria and Vancouver.

Mr. I. L. Merrill, president, and Mr. W. B. Dickson, vice-president of the Hedley Gold Mining Company, were at Hedley, Similkameen, B.C., last month, visiting the company's Nickel Plate group of mines, and 40-stamp mill. The company has already paid three five per cent. dividends, aggregating $180,000, and is expected to pay at least ten per cent. more at the end of December, proximo.

Mr. W. G. Norrie, for some time past on the staff of Mr. A. G. Larson, consulting engineer, Vancouver, has been appointed superintendent of the Lucky Jim zinc mine, at Bear Lake, Slocan, B.C. Mr. Norrie has been, during a number of years, on the staffs of, respectively, the Le Roi Mining Company, McGillivray Creek Coal and Coke Company, Columbia Coal and Coke Company, and Ikeda Mines. For the last two years he has been with Mr. Larson.

Mr. J. L. Parker, of Vancouver, B.C., has spent the summer and autumn months of the current year on his Lee Lake ranch, near Burmis, southwestern Alberta, in the vicinity of which he has, as well, some coal lands.

Mr. Thos. G. Proctor, of Victoria, B.C., managing director of the Lucky Jim Mines, Ltd., has been in Winnipeg, Manitoba, conferring with his co-directors concerning the future operation of the company's mine, in Slocan district, B.C. Shipment from the mine of zinc ore has been in progress during recent months.

Mr. J. L. Retallack, of Kaslo, B.C., has been in Hazelton district, Skeena river, examining the Silver Standard silver-lead mine, owned by the Stewart & Welch syndicate. A local newspaper states that much more underground development is to be done, and a compressor and power drills are to be added to the mine equipment.

Mr. A. B. Ritchie, who recently returned to British Columbia from a trip to the Provinces of Ontario and Quebec, is now superintendent of the Consolidated M. and S. Co.'s Molly Gibson mine, in Nelson mining division.

Mr. M. K. Rodgers, of Seattle, consulting engineer, has gone to Mexico to look at some mining properties in that country. Mr Rodgers is well known in British Columbia in connection with the earlier development of the Nickel Plate and Hidden Creek mines, both in the province.

OBSERVATORY INLET, BRITISH COLUMBIA.

By R. G. McConnell, in "Summary Report of Geological Survey," 1911.

So much interest is being taken in the development of the Granby Consolidated Mining, Smelting and Power Company, Limited, of what it is believed will prove to be a large copper mine, situated near one of the bays of Observatory Inlet, that the following extract from the report of Mr. R. G. McConnell, of the Geological Survey of Canada, on Observatory Inlet, will most likely be widely read by those who do not usually see the "Summary Report" of the Geological Survey Department. It may be well to here state that Goose Bay, mentioned by Mr. McConnell, is known as Granby Bay.

Observatory Inlet.

Observatory Inlet parallels the lower portion of Portland canal on the east, and is connected with it by a passage north of Pearce Island. Its shore-lines are more irregular than those of Portland canal, and toward its head it divides into two branches known as Hastings arm and Alice arm. Hastings arm continues in the general northerly direction of the main inlet, but Alice arm bends to the east and, like Portland canal, cuts through the granitic batholith of the Coast range and penetrates for some distance the argillites and associated rocks which border it on the east.

At the junction of the two arms, the inlet expands in width and contains a number of islands, some of large size. Larmoc Island has a length of seven miles, and Brooke Island of three miles. West of Larcom island is Goose Bay, an irregular sheet of water three and a half miles in length and from half a mile to a mile in width. The principal known mineral deposits of the inlet are situated in this vicinity.

The inlet is bordered on both sides by mountains in groups and short ranges except near the head of Alice arm. From this point, a high rough plateau broken by basaltic cliffs extends eastward to the Nass valley. The mountains present, as a rule, steep, glacier-worn sides toward the inlet, and range in height from 3,500 to nearly 6,000 feet. Glaciers occur in some of the valleys, but are not so large and conspicuous as along Bear River.

The streams entering the inlet are all of moderate size. They include Falls creek, a short stream with numerous falls emptying into Goose bay; the Kitzault and Illianci, at the head of Alice arm; and a branching sediment-laden stream at the head of Hastings arm. This creek is utilized to operate the plant at the Hidden Creek mine. It is a steep stream and flows a large volume of water during the greater part of the year, but, like all of the streams of the district, the supply becomes greatly diminished during the midwinter months.

Geology.

Observatory inlet has its whole course in the Coast range and the rock sections along it consists mostly of granite. A large included mass of argillites associated with greenstones, mostly pyroclastic in origin, occurs at the junction of the two arms, and argillites also occur along the upper part of Alice arm.

Granites.—Granites occur along Observatory inlet from Pt. Ramsden, opposite Pearce island, northward to a point near the southern end of Goose bay, where they are replaced by argillites and greenstones. The latter are exposed along the shores of the inlet for a distance of nine miles, and are then followed by granites and allied rocks, which continue to the head of Hastings arm and for some distance beyond.

"Alice arm extends eastward beyond the eastern edge of the Coast Range batholith. The mountains along the lower portion consist of granite, and those bordering the upper portion of argillites interbanded in places with greenish feldspathic beds.

"The granites along Alice arm and the lower part of Hastings arm are medium-grained, occasionally porphyritic, greyish rocks made up mostly of quartz orthoclase and plagioclase with sparingly distributed biotite. In the upper part of Hastings arm, the grey granite is replaced by a dark-colored, more basic and apparently older variety, feebly schistose in places, and cut near the contact by acid granitic dikes. This rock is very coarse-grained in places, has hornblende as the principal dark mineral, and represents a transition phase between the granites and diorites.

"**Argillites.**—An area of dark argillaceous rocks with some greenstones, enclosed on all sides by granite, occurs at the junction of Alice and Hastings arms. The area has a width along the west shore of Observatory inlet of nine miles, but narrows to the east. On the east shore it is barely two miles wide, and the area appears to wedge out in the bordering mountains. Larcom, Brooke, and some smaller islands near the junction of the two arms, consist of argillites cut by granitic dikes. The area, while not traced through, probably extends westward to Portland canal, as similar rocks somewhat more highly altered occur in the same strike in the vicinity of Maple bay.

"The argillites and associated beds are very similar to the rocks of the bitter Creek series of Bear river, but cannot be definitely correlated with them until the intervening region shall have been more closely examined. The principal variety is a fine-grained sedimentary rock, made up largely of partz grains with some feldspar, darkened with carbonaceous material. Mica, mostly secondary, is usually present, and in places the argillite passes into a quartz mica schist. Secondary quartz, pyrite, calcite and hornblende are also common constituents.

"In texture the agrillites vary from a hard, fine-grained, compact rock to a granular one in which the grains are distinctly visible. The color varies with the texture, becoming lighter with increasing coarseness, and in places the fine-grained, dark and coarse, greyish more feldspathic varieties alternate in thin bands.

"The argillites are seldom, and only over limited areas, cleaved into slates. Usually they occur in rather heavy beds from one inch to six or more inches in thickness, and in weathering form a talus of angular fragments.

"The associated rocks are greyish limestones and beds and wide bands of greenstone. The limestones are not prominent, and only occur in small beds and bands seldom traceable for any distance. The greenstones largely replace the argillites toward the southern edge of the area. They are granular, mostly fragmental rocks.

"The beds of what may be called the Goose Bay argillite area, are folded into a number of anticlines and synclines, striking approximately east and west, or parallel to the long axis of the area. The dips, as a rule,

are regular and comparatively low, although, in places, the strata are steeply tilted and strongly distorted. No faulting on a large scale was observed.

"The Goose Bay sedimentary beds occupy a depression in the granitic rocks of the Coast Range batholith, and are cut by numerous acidic dikes genetically connected with it. Various types are represented, including pegmatite, aplite, quartz porphyry, and granitic dikes. A second system of lamprophyric and basaltic dikes, younger and more basic in character than those connected with the granitic intrusion, is also prominent. The dikes of this system are later than the mineralization of the region.

"Dark, sedimentary rocks very similar to those in the Goose Bay area occur along the upper part of Alice arm, east of the main granite area. They consist mostly of fine-grained, dark, slaty rocks, often in heavy beds, with coarser feldspathic bands, some of which hold small angular fragments. Farther north along the Kitzault valley, in the vicinity of the Red Bluff group of claims, the dark sedimentary rocks are largely replaced by fine and medium-grained greenish fragmental rocks, tufaceous in character. These rocks include dark argillaceous bands and are much less altered than those in the vicinity of the granite. Their relation to the latter was not ascertained, as in the course travelled along the valley the connecting section is concealed.

"No fossils were collected and no evidence in regard to the age of the sedimentary rocks was obtained, other than that they are cut by, and are, therefore, older than the Coast Range granitic batholith usually referred to late Jurassic or early Cretaceous. The argillites are often highly altered locally, in places passing into mica schists, but this is attributed to the great granitic invasion and affords no proof of extreme age. It is probable that none of the sediments are older than the Carboniferous.

Mineral Deposits.

"The mineral deposits of Observatory inlet consist of quartz veins containing value in silver and lead and, in one case, in molybednum, and of what can only be described as mineralized areas containing low value in copper. The latter will be described first.

Hidden Creek Copper Company.

"The claims controlled by the Hidden Creek Copper Company were staked about ten years ago, and a considerable amount of surface and underground work was done on them by the Hidden Creek Copper Company under the direction of Mr. M. K. Rodgers. Recently the claims were acquired by the Granby Consolidated Mining, Smelting and Power Company, operating at Phoenix, British Columbia.

"**Situation.**—The claims are staked on the summit and sides of a hill 920 feet high, enclosed between two branches of Hidden creek, and situated 8,500 feet north of Goose bay, near its outlet into Observatory inlet. A good wagon-road, planked where necessary, about two miles in length, has been built from the portal of the main tunnel to a wharf at Anyoux on Goose bay, the shipping port of the mine, and a tramway, partly gravity and partly traction, to the same point, was commenced some years ago, but never completed.

"**Rock.**—The rocks in the vicinity of the mine consist of dark and dark-grey argillites with occasional light-coloured, coarse-grained, feldspathic beds, and rarely some limestone. Beds and bands of greenstones, probably largely of pyroclastic origin, occur with the argillites, but are not prominent in the vicinity of the mine. Both argillites and greenstones are always more or less altered, and in places pass into mica, quartz-mica, and chloritic schists. The bedding is coarse, and while a strong cleavage is developed in spots, the bedding planes over most of the area constitute the principal partings. The beds have been compressed into several folds, and, in places, dip steeply, but are seldom, in the section examined, overturned, and no large faults were observed. The strike, while generally east and west, shows considerable variation in places.

"The argillites and associated rocks are exposed over an area about nine miles wide, where cut by Observatory inlet. They are surrounded by the granite rocks of the Coast range, and are considered to be an undestroyed and deeply sunken portion of the old roof of the Coast Range batholith. The basin they occupy is of great depth, as the sedimentary rocks of the inclusion are exposed from base to summit of mountains more than 5,000 feet in height, and they must extend for a considerable depth below the present surface.

"The argillites are cut by numerous dikes, one set being older than the mineralization of the region, and genetically connected with the enclosing granitic rocks. These vary widely in character and include granitic, dioritic, quartz-porphyry, aplite, and pegmatitic types. In addition to these, a second widely distributed set occurs, the members of which intruded after the mineralization of the region. These are fine to medium-grained basic dikes often of a lamprophyric character. Thin sections from examples cutting Mammoth bluff showed laths and occasional phenocrysts of feldspar, mostly plagioclase, with abundant brown hornblende in long prisms and occasional plates of mica. Rounded, irregularly bounded quartz grains, possibly of foreign origin, are also present, and large calcite areas, probably representing original olivine, are of frequent occurrence. A second type obtained from a dilke crossing the main tunnel of the Hidden Creek mine between the two orebodies, contained large olivine and augite phenocrysts in a fine-grained hornblende-feldspar base and is classed as an olivine basalt. A third type, represented by a dike crossing the Redwing, consists mainly of hornblende and plagioclase and possesses a well-marked ophitic structure.

"The later dikes may be connected with a basaltic flow which caps the hills south of Alice arm. They do not appear to affect in any way the orebodies they [illegible].

"**Workings.**—A large amount of surface and underground work has been done on the Hidden Creek mine. The mineralized area is very large and was first outlined roughly by long trenches running in various directions. Subsequently a working tunnel was started below what is known as Cabin bluff at an elevation of 530 feet, and has been driven straight into the hill in a northwesterly direction for 950 feet. A drift to the left from the main tunnel, starting 85 feet from the face, has been carried in for a distance of 300 feet and several shorter drifts from points along the main tunnel serve to explore the ground bordering it.

"Beside the main working tunnel and its branches, a number of shorter tunnels have been driven at various heights into the iron-stained slopes of Cabin and Mammoth bluffs. One of these, commenced in a depression at the foot of Cabin bluff, is connected by an upraise with the main tunnel.

(To be continued.)

SPECIAL CORRESPONDENCE

NOVA SCOTIA

minion Coal Outputs.—The Dominion Coal Com- 's output still maintains a high level. In October roduction from the Glace Bay mines totalled 422,- ons, a figure that will probably stand as the largest hly output of the year. Last October's output 348,002 tons, or 74,000 tons less than was obtained year. The output of the Springhill mines was 37,- ons, so that the combined coal production of the pany's collieries was 460,000 tons for the month of ber.

mparing the ten months ending October 31 with ame period of last year the production for 1912 s 3,743,000 tons, against 3,322,000 in 1911, showing crease of over 420,000 tons. With Springhill fig- added the Company's total production for the nonths of this year is approximately 4,100,000 tons.

anges in the Coal Company's Management.—It is unced that Mr. M. J. Butler has resigned the posi- of general manager of the Dominion Iron and Steel pany, and of the Dominion Coal Company, which s held since the beginning of 1910. Mr. Butler's nation took effect on the 1st of November. Mr. . MacDougall, who has, during Mr. Butler's man- ship, filled the position of assistant general man- of the Dominion Coal Company, along with the ion of superintendent of mines and quarries for Dominion Steel Company, is appointed second vice- dent and general manager of the Dominion Coal pany. It is understood that Mr. MacDougall's s will comprise the direction and control of the s and quarries of the Steel Company, or, in short, production and assembly of all raw materials. At ime of writing no official announcement has been of the exact nature of the changes which Mr. er's resignation will entail, beyond that of Mr. Dougall's appointment.

cidents in the Use of Breathing Apparatus—A ten- y has recently manifested itself on the part of makers of breathing apparatus to make use of mishap or accident which may occur in the wear- apparatus to decay the manufacturers of the rival er and point out the excellencies of their own. It be pointed out that this is a very unwise pro- re and will eventually react on all types of breath- apparatus. Your correspondent is in receipt of a phlet from the United States representative of an lish firm of rescue apparatus makers, which re- s the death of a member of the Pittsburg Mine ue Corps while wearing a breathing apparatus to ore a sealed-off district of a mine filled with nox- gases. An examination of the apparatus after the very of the body showed the presence of a small in the breathing bag, through which outside air drawn by the action of the injector. It is also d that a small crack was present in the solder joint he "cooler," very hard to detect "**except by pres- test.**" The leaflet further states that the water ge test of the apparatus was evidently neglected. ems an obvious conclusion that this particular ap- tus must have been in poor condition, and that had een submitted to the tests which every breathing ratus should undergo before they are used in lly atmospheres, it would not have been considered o use. Breathing apparatus are, and must neces- sarily be, delicate pieces of finely adjusted mechanism. They remain unused for long periods, and when they are required the necessity is usually immediate. But it should be a rigid rule of every mine rescue corps that no man shall descend into irrespirable atmospheres except with an apparatus that has been thoroughly tested in the manner that every competent staion superintendent knows his apparatus should be tested. To call attention to the possible defects and dangers of breathing apparatus and to suggest the remedy is a laudable proceeding, but to take every such occasion as an opportunity to "knock" the rival device is most reprehensible and unworthy of reputable makers, who should be content to stand on the merits of their own device. It is a proceeding which will most surely bring its own revenges. The accepted types of oxygen breathing apparatus which are on the market to-day are almost identical in principle and operation, and their differences consist largely in detail of arrangement, often necessitated by the avoidance of a patented specialty. A continuation of a campaign of the kind alluded to may well cause the unbelieving public to include all types of breathing apparatus in the same condemnation, and to lose faith in all of them. This would be a deplorable error, as these devices are to-day only in the beginning of their future usefulness.

One feature which the extended use of these devices is daily making more and more apparent is that people who undertake to provide breathing apparatus, must also undertake to have them kept in constant readiness and efficiency. Ill-kept apparatus is far worse than none at all.

Cheap Coal from Nova Scotia.—Nova Scotia keeps in the very forefront of modern mining practice, and if one could believe the Glasgow Weekly Herald, the mining engineers of the province by the sea are very brainy and progressive gentlemen. The following veracious news item is clipped from the Weekly Herald:

"The South Metropolitan and the Gas, Light & Coke Companies have received an offer from the owner of large coalfields in Nova Scotia to supply them with all the coal they require at a less price than that which they are now paying the colliery owners in the North of England. An economy in the cost of extraction and delivery of coal by machinery, and, more particularly, in consequence of the profits at the pit's mouth by distilling all the surplus coal for oil, sulphate and ammonia, and coke, has made this offer possible. The owner, whose name he at present wishes to remain unpublished, is prepared to land coal upon the Thames from Nova Scotia at a cost of about 1s. 3d. a ton carriage, the whole cost of the material being under 16s. a ton. A new type of collier has been designed to convey the coal. It is believed that return freights across the Atlantic will always be available, but apart from the offer to the companies to supply coal it is interesting to note that by the process which has been adopted at the collieries in Nova Scotia whereby the coal has been transformed into oil, the companies will be enabled, if necessary, to make the whole of their gas by means of the oil which can be procured from Canada. It is considered possible to obtain from the collieries, which extend over 40 square miles anything between 10,000 and 20,000 tons a day, half of which would produce something like 2,000 tons of oil. At the present

moment the Gas Light and Coke Companies use oil exclusively in the production of gas."

It is to be regretted that the owner of these unusual Nova Scotian collieries wishes that his name should not be published. The statement that it is considered possible to obtain from these collieries "anything between 10,000 and 20,000 tons a day, half of which would produce something like 2,000 tons of oil" is delightful.

Bettington Boilers.—At the time of writing, two out of an installation of three Bettington boilers at the new power plant of the Dominion Coal Company in the Lingan district were just completed. At the first test on one of these boilers fifty pounds of steam was raised in twenty-three minutes from the starting of the flame. When it is considered that the bricks and tubing and everything connected with the boiler was damp, this is a very good showing. It is of melancholy interest to note that Lieutenant Bettington, the talented inventor of this new type of boiler, recenly lost his life in an aeroplane accident near Salisbury Plain, England. The installation has been put in by Fraser, Chalmers & Co., under the direction of their engineers, and as noted previously is the first of its kind in America.

ONTARIO.

COBALT, GOWGANDA, SOUTH LORRAIN

Cobalt, Gowganda and South Lorrain—Nipissing Shipments.—In the month of October Nipissing mines produced $90,000 and shipped $322,000 net. The small production was due to the fact that the old sorting plant has been closed down and the new washing plant at the new mill had not started up. The entire output from the mine for the month was in bullion, no low-grade ore being shipped. The new mill will certainly be running by the middle of this month, as the bins are full and the plant is ready save for some small adjustments. In view of the excellent discovery on the Seneca Superior at Cart lake the Nipissing will probably reopen the old workings at shaft 86, which has not been touched for some time. The development on the Seneca Superior is proceeding satisfactorily, and the company definitely entered the shipping lists with a carload of screenings from the new vein.

General Assets Acquires Cochrane Mines.—General Assets, Limited, of Toronto, has taken over the Cochrane mine and will proceed to develop it. Camps will be built on the southern end of the lot and a shaft sunk. Previous work on the Cochrane was almost entirely confined to an endeavor to find the extensions of the Temiskaming veins, although on the surface promising silver discovery was made to the south. Mr. J. F. McKenzie, formerly in charge of the Dome Lake for the same company will superintend operations.

Townsite Labour.—After a brisk struggle the strike at the Cobalt Townsite mine has been broken. After being on strike for about two weeks the men took a vote and decided to go back to work. The Western Federation of Miners took no official part in the struggle. The question at dispute was the length of shift, the 200 men working underground striking for an nine-hour instead of a ten-hour day.

The mine was closed down for about ten days, when the company managed to induce some of the men to go back and some of the strikers returned to work.

T. and H. B. Report.—The annual report of the Temiskaming and Hudson's Bay Mining Company showed that the year had been as fruitful of dividends as usual. The gross revenue was increased by $127,000 and the net earnings by $76,000. Dividends were paid amounting to $290,404. The total production for the year was 957,055 ounces, an increase of 152,431 ounces, against the total for last year. The cost of production was 14.9 ounces, or exactly the same as last year.

No less than 2,700 per cent. was paid in dividends this current year, against 1,600 per cent. for the preceding year. As to the physical condition of the properties, Mr. A. H. Brown, the manager reports that "the mine workings and plant are in good condition, so that a production equal to that of last year may be expected during the coming twelve months." Three veins were found during the year, one of them important. Work at the Gowganda claims has been costly and the results not very satisfactory, but development will be continued and the shaft sunk to 200 feet, and, as it is believed that better and more consistent values will be found in the veins at depth.

La Rose Lucky.—A very welcome addition to the ore reserves of the La Rose has been made at the 180-foot level of the Lawson mine in the northwest corner of the property. The vein is in places six inches wide of high-grade ore, but does not maintain either width or values uniformly.

Foster Lease.—On the Foster operations are being conducted at the 50-foot level by the Flynn Syndicate. The new management has already met with a little success, and has opened up a mud seam carrying some silver in leaf form.

Hargraves Affairs.—The Hargraves has been milling some ore in the Cobalt Central mill and will make a small shipment of concentrates soon. The company is continuing to work the mine in the hope of discovering more ore shoots, and they are still in tolerably good financial position to continue development.

Ruby Silver Progress.—At North Cobalt a small two-stamp mill is being erected on the Ruby Silver, and an attempt is being made to find silver on the Cobalt Contact, the Red Rock and some others. A small shipment of smaltite ore was made by the Lost and Found Company from the Cobalt Contact. It is the Lost and Found Company that is now carrying on the work at the North Cobalt properties. No very encouraging developments have been made to date.

PORCUPINE AND SWASTIKA

Porcupine and Swastika—Hollinger Bulletin.—With the issuance of the first four-weekly statement of the Hollinger Gold mines, the Porcupine camp is on a firm basis. There is no longer any doubt of the permanence of the industry. The report goes into considerable detail, and it is a matter for commendation that the company intends to inform its shareholders and the public exactly the position the mine is in every four weeks or at the time they receive their dividend. As Mr. Robbins says, milling operations date from July. Since that date $500,000 represents the net profits of operations. The profits at the present time represent $40,000 a week and the dividend $90,000 every four weeks, so that there is plenty of margin left for contingencies. Satisfactory as the report of Mr. P. A. Robbins shows that the physical development of the property is, it is understood that since the summary was written there has been a marked improvement. To the observer superficially glancing over the report the table showing values on the No. 1 vein would not appear reassuring. As the No. 1 vein is the backbone of the mine this would appear serious. On the face of it the table shows that there is 1,000 feet of a vein 8 feet

wide of an average value of $31.54 a ton at the 100-foot level, at the 200-foot level there is 839 feet 6.7 feet wide of 45.74 ore, but at the 300-foot level, where the No. 1 vein has only been opened up for 63 feet, the vein is 5.7 feet wide and only runs $8.40 to the ton. Read without the note over the page, this is not reassuring as to the future of the mine. Mr. Robbins, in his note, partly elucidates the situation. He says: "On the 300-foot level development has been delayed pending the completion of a crosscout from No. 1 vein to No. 37 vein for the purpose of establishing ventilation. The average value of $8.40 shown for the 63 feet of drifting upon the 300-foot level corresponds with the values contained in this particular block of ground on the level above. The winze from the 200-foot level to the 300-foot level was sunk in a position convenient for working without regard to values. There is no change in values of formation between the 200 and 300-foot level." That makes the position reasonably clear, but if it had been added that a flat drill hole had already been used to prospect ahead of the drift and that the core showed over $30 ore it would make the situation quite plain.

Mr. Robbins states that "the average value of all ore removed from the mine to date is $23.69 per ton established by treating 26,221 tons in the original test mill and in the new mill." This included dump ore, waste rock mined in drifting and sinking and ore from development work as well as ore from the stopes. The dump has now been cleared out of the way and in the future the ore will run well over $30 as most of it will come from the stopes. There are now 30 drills running in the mine. On the 200 and 300-foot levels alone there are 18 faces in ore, twelve on the 200 and six on the 300-foot. There is every probability that in addition to the regular four-weekly dividend the company will pay a bonus as a Christmas or New Year's gift.

Plenaurum.—Of all the other Porcupine properties (excluding the Dome), it is possible that the Plenaurum has made the most headway during the past month. After connecting the two shafts under Pearl Lake drifting operations commenced on the veins and four are now being worked in both directions. Generally speaking results are entirely satisfactory and before the spring the Plenaurum should have a tonnage of ore in sight which will justify the erection of a mill. Still more important is the fact that a winze sunk on the No. 6 vein is at a depth of 67 feet below the 200-foot level still in high grade ore and the vein three feet wide. Its neighbour, the Jupiter, is also holding the improvement noted in the last two or three months. There has now been developed in the No. 1 series of veins a length of 270 feet of a good average milling width and values. Another body of quartz running parallel to the first vein has been located and will be opened up and sampled. If it proves to be milling ore the stoping width in this particular spot in the vein will be very considerable. Careful plans are being prepared for the erection of a mill next year if the continued good development of the property warrants it. At present the management is feeling its way very carefully.

Vipond Mill—The Vipond mill is shut down and will remain so until certain alterations to the mill structure, necessary when the cyanide plant is installed, have been made. This will not be more than two or three weeks when the mill will be started up again and will continue to produce until the cyanide plant is ready. The cyanide plant is an addition to the present plant. Underground work continues, about 35 men being employed.

Schumacher.—The shaft at the Schumacher mine is being pumped out, and from present indications it appears possible that a concrete bulkhead can be built and operations resumed from the same workings. It will be remembered that the surface caved in on the drift at the 100-foot level and flooded the mine. There will, of course, be no further attempts made to proceed further with the drift towards the lake at the 100-foot level, but if pumping is successful in getting rid of the water the shaft will be sunk to the 200-foot level and the cross-cut towards the lake resumed from there.

Mr. R. B. Watson is to make an examination of the Foley-O'Brien mine and report to the company on the advisability of resuming work there.

Crown Chartered Takes a Rest.—The Crown Chartered is still closed down and will remain so until the directors can agree on joint action. The only property now working in Northern Tisdale and Southern Whitney is the Hughes. The Porcupine Lake is now sinking an incline shaft near the shore of Porcupine Lake, the fall has been spent in erecting a plant adequate for the very extensive mining campaign mapped out for this winter.

C. M. and E.—The Canadian Mining and Exploration Company is very thoroughly sampling the Smith and Markey claims in Night Hawk Lake. These claims include Gold Island, samples from which precipitated the rush into Night Hawk Lake in 1908. Under the direction of Dome officials the ore body is being very thoroughly sampled so that a mill run can be made. There was at one time a small mill on the property but it has been burnt down. As a consequence of the operations of the Canadian Mining and Exploration Company there has been much staking and re-staking in Langmuir and Cody. There has also been a revival of interest in Turnbull and other townships to the west of Porcupine.

Alexo Won't Sell.—TheAlexo Mining Syndicate, possessing the nickel deposit near Kelso has refused an offer from the American Smelting and Refining Company, and has determined to work the mine themselves. The offer after an examination by Mr. Kirby Thomas was very similar to that offered for the property four years ago by the Canadian Copper Company, and finally given up after it had been diamond drilled. Though no underground operations have been conducted this year development have been very satisfactory. Stripping along the big vein has shown a considerable tonnage of ore where before no ore was believed to exist. The vein has now been opened up for 250 feet, and for that distance there is continuous ore of high-grade quality. Since the tenth of August 1,300 tons have been taken out by an open cut and shipped to the Mond Nickel Company at Victoria Falls. This company so appreciates the high-grade of the Alexo ore that it has made certain concessions which will net the company three dollars more per ton. They are now paying on copper contents when it runs less than one per cent., and they have removed the penalty for cobalt. A small plant will be installed soon when underground operations will be resumed and it is hoped that a car a day will be shipped. So far all the ore has come from the surface, two glory holes and open cuts not more than six feet deep. The force has this summer never exceeded seven men, and the ore has been most economically extracted. A good profit has been made on the season's operations and the plant will be bought out of the profits.

Mr. C. A. O'Connell, recently manager of the Trethewey mine, has been appointed to superintend operations at the Tough properties near Swastika. Developments

here have been so satisfactory that Mr. C. E. Foster who has purchased the control, will proceed to open up the veins on a much more considerable scale.

BRITISH COLUMBIA.

With the exception of the continuance of the strike of the miners at the coal mines of the Canadian Collieries (Dunsmuir), Limited, Vancouver island, and a reduction in numbers of men employed at two or three mines in Slocan district, where the miners had asked for higher wages, mining has been generally active in the province. Two metalliferous mining companies paid dividends during October, namely, the Consolidated Mining and Smelting Company of Canada, Limited, to a total amount of about $232,000, and the Standard Silver-Lead Mining Company, with a total of $50,000. The latter was the seventh monthly dividend the company had paid this year, and it made the aggregate of its dividends $375,000, paid $25,000 in April and $50,000 a month since.

The following notes are on districts not producing ore to any considerable extent, but which are regarded as likely to eventually add considerably to the mineral production of the province:

LARDEAU DISTRICT NOTES.

The outlook for mining in Lardeau district is now better than for several years past, as will be indicated by the following items of mining news:

Ferguson Mines, Limited.—The prospects for shipping ore the ensuing winter from this company's Silver Cup mine are promising; it is stated that not for at least three years have conditions been so favorable as now. The development work done during last summer has resulted in the mine having been placed on a basis that will allow of profit being earned on mining operations. This is the more encouraging since it is expected that returns will be received showing a larger output of silver-lead ore and proportionate earnings.

On the company's Ajax claim, adjoining the Nettie L., distant about one miles from the town of Ferguson, a recent development is attracting much notice throughout the district. In raising from No. 1 level, at between 30 and 40 ft. up a body of galena ore was found. When the information was received concerning this, there was 12 ft. 6 in. of ore exposed, and ore still in the face of the working. The value of this ore is given as from $80 to $100 a ton. As little production of importance has been made from this part of the company's property in recent years, this find is regarded as one of the most important developments experienced for a long time past.

The Nettie L., which formerly was one of the largest shipping mines of the Lardeau district, has been leased to Messrs. S. A. Sutherland & Co., after having been unworked for about seven years. The lessees have been operating here about three months, and already have taken out a carload of ore of excellent grade, while conditions indicate that it will be practicable to continue production.

Noble Five Group.—Mr. Andrew M. Craig, of Trout Lake City, has exposed in a 24-ft. open-cut on one of the claims of his Noble Five group, a 7-ft. lead of quartz matter in schist. In this there is about 20 in. of solid shipping ore. A cross-cut has been driven 90 ft., and to get under the above-mentioned good showing of ore this will have to be extended about 50 ft. A depth of 85 ft. from the surface will be gained, and, owing to the steepness of the mountain, the gain in depth will be foot for foot of driving, when the lead shall have been cross-cut and drifting into the mountain be done. A shipment of 17 tons of ore from this property gave a net return of $83 a ton, after payment of $41.50 a ton for packing, freight, and treatment, making the total value of the ore $124.50 a ton. Supplies will be taken in to the claim shortly, so that work may be resumed before next spring.

The Noble Five group is near the head of Brown creek, a tributary of Ten-mile creek, and is on the southern part of Silver Cup mountain. It is some 2½ miles beyond the Winslow group, and is 8 miles distant from Trout lake.

Horseshoe.—Mr. Craig has had packed out from the Horseshoe, which is three miles by trail from Trout Lake City, a few tons of sorted ore estimated to run about $300 a ton. Work will be continued in the winter, and it is expected that more ore will be available for shipment by the time the trail shall be good enough for packing. The Horseshoe adjoins the Lucky Boy, which latter, as well as the Ethel, has been a shipper in the past.

Other Properties.—Beside those above-mentioned, there are other properties in various parts of Trout Lake mining division that are having attention, so that from some of these, as well, good results are expected.

BIG BEND OF THE COLUMBIA.

French Creek.—Some placer-gold recently exhibited in Revelstoke has assisted in causing renewed interest to be taken in placer-gold mining on creeks in the Big Bend part of Revelstoke mining division. The heap contained between 40 and 50 oz. of placer-gold recovered by Mr. L. M. Remillard from his placer claims on French creek, situated immediately above the property worked in past years by the old French Creek Mining Company. Mr. Remillard has been working here for about two years, and is now well pleased with the results he is getting. The local water-supply situation is not favorable to the recovery of gold after the beginning of October, but he is continuing work in preparation for gravel-washing when conditions shall allow of its being done. He believes he has found an old channel through his ground and that it will pay him well to work it.

Higher up French creek is situated the Pioneer Placer Mining Company's ground, to which, it has been reported, a Keystone drill was taken lately for the purpose of testing the ground for prospective purchasers.

Below the Remillard group are three placer leases held by a Revelstoke syndicate, which has obtained a water record and intends to work this property next season. It is thought the old channel above referred to crosses the ground comprised within these leases, and that it will be found to contain good pay-gravel.

Smith Creek.—Chicago and Washington men have obtained an option from Mr. Harry Howard on his claims near the mouth of Smith creek and fronting on Columbia river. This ground formerly was held by the old Columbia Hydraulic Mining Company. The bonders have also secured seven placer leases up Smith creek to the westward, and they purpose beginning mining operations next spring.

Other Creeks.—Two placer leases have been taken up on ground on Eight-mile creek, and Mr. Raymond Allen has done a lot of work on Camp creek. Several placer leases have been taken up on other Big Bend creeks, so that altogether much activity in placer-gold mining next season is looked for.

Mica in Big Bend.—Two syndicates—one of Calgary and the other of Revelstoke men—have secured mica-bearing claims at the head of the Big Bend, and good samples of mica have been obtained. This mica-bearing locality is a different one to that of Tete Jaune Cache district, farther north, concerning which news has occasionally been published in past years.

QUEEN CHARLOTTE ISLANDS.

Among many mineral claims on Moresby island of the Queen Charlotte group are some in the vicinity of Lockeport, Jedway, and Collison bay, respectively, that have lately been under examination by Mr. A. G. Larson, of Vancouver, and two assistants. It is understood that Mr. Larson is favourably impressed with some of the properties investigated. The majority of the mineral showings examined are thought to be sufficiently promising to justify further development.

While prospecting operations for coal and oil are being continued on Graham island, little definite information is made public concerning results. From time to time the island is visited by coal mining engineers, some of whom are strong in their denunciation of the gross exaggerations that have appeared in advertisements having for their main object the sale of shares. Several organizations, however, have been engaged in prospecting and development work, so that it is considered probable production of coal will be practicable from one or two properties whenever the necessary handling plant shall be put in.

IN SKEENA DISTRICT.

Among a number of promising silver-lead mineral claims in the vicinity of Hazelton, Skeena River district, on which silver-lead ores are reported to occur, are those comprising the Silver Standard group, on Glen mountain, about five miles north of Hazelton. A few weeks ago the Omineca Health gave an account of a visit paid to this property by Mr. John L. Ratallack, of Kaslo, B.C., a well-known Slocan min-owner and manager, and Messrs. J. W. Stewart and P. Welch, railway contractors, who are owners, or part owners of the property. The party was shown the mine by Superintendent Haskins. The Herald said: "After the inspection—and it may be mentioned that Mr. Retallack, who had examined the mine on two other occasions, stated there was absolutely no doubt about the Silver Standard becoming one of the best producers in the country—the owners of the property got together and decided upon plans for the immediate commencement of development on a much larger scale than has yet been attempted on any property in this district. The first thing will be to enlarge the camp to accommodate the larger number of men who are to be employed as quickly as things can be got in readiness for them. A compressor plant has been ordered for immediate shipment, and it is expected to arrive within the next ten days. Power drills have been ordered, together with all requisites for the new plant. Upon its receipt at the mine the machinery, etc., will be put in, and thereafter the heavy work will be commenced. One of the first things to be undertaken will be the work of driving a cross-cut tunnel from the 250-ft. level from the main shaft on No. 2 vein, to cut No. 3 and other veins above. This will open several of the larger veins and put the mine in shape to become a continuous and permanent shipper. It is estimated that this work will allow of some 40 tons of ore being mined a day and shipped to a smeltery.

CASCADE RIVER, PORTLAND CANAL MINING DIVISION.

During the greater part of the current year development work has been in continuous progress on the Cascade Falls Mining Company's group of mineral claims, situated in the Salmon River district of Portland Canal mining division, and results have proved generally satisfactory. Work has been restricted chiefly to driving a cross-cut tunnel, with the object of cutting at depth a vein described as being 20 ft. in width and containing silver-lead ore. This vein previously had been exposed in a number of surface cuts along a distance of between 300 and 400 ft. The underground cross-cut reached the vein early in September, and since then the working has been in ore of quite a different character to the galena, pyrite, and chalcopyrite found at the surface, for the fissure was filled with quartz and schist, which, though not at first thought to be of much value, has since been found to contain gold and silver, for assay returns of samples have been obtained that show from 1.24 oz. to 2.04 oz. gold and 87.4 to 93.4 oz. silver to the ton. The vein was reached at between 230 and 240 ft. from the portal of the cross-cut adit. The depth at the face is 135 ft. The ore obtained in the drift is stated to be of the highest grade yet found at depth in Salmon River district. A favourable smelting rate has been quoted, so it is the company's intention to ship ore during the coming winter.

The following excerpt has been taken from Mr. R. G. McConnell's report on the Salmon River district, included in the "Summary Report" of the Geological Survey for 1911:

"The first camp reached ascending Cascade river is that of Bunting Bros. and Dillworth, situated at an elevation of 1,050 ft. on the eastern bank of the east fork of Cascade river about a mile northeast of the International Boundary, and 12 miles from Portland canal, following the Salmon valley. A joint stock company, under the name of the Cascade Falls Mining Company, has recently taken over the five claims held by this syndicate.

"The principal showing occurs on Cascade Falls No. 2 claim, and consist of a mineralized zone traversing the greenstone schists which form the country rock in an easterly direction. The schists for a width of more than 30 ft. are altered and strongly silicified and pyritized. In portions of the zone galena is present in considerable quantities, associated with some zinc blende and occasional grains of chalcopyrite. A rough sample across 8 ft. of the best mineralized portion of the lead assayed in the laboratory of the Department of Mines, yielded: Gold, 0.14 oz., and silver, 7 oz. per ton, and lead 7.60 per cent. Ore of this grade could doubtless be mined at a profit in the district if present in quantity, but the extent to which it persists either in depth or along the strike of the lead has not yet been demonsrated. The mineralization is irregular both across the lead and along its strike, portions of the zone containing little or no galena, which is the principal silver-bearing mineral; and the present workings are limited to a shallow cut in the steep hillside across the lead and some surface stripping. The prospects are, however, considered favourable enough to justify a considerable expenditure for further exploratory work."

It should be remembered that about a year had elapsed between the time of Mr. McConnell's visit to the Cascade Falls group and that at which the information first above-given relates to, the latter having been only quite recently supplied.

COMPANY NOTES

CANADA IRON CORPORATION.

The second annual meeting of the Canada Iron Corporation was held in Montreal on October 24th. The profits for the year, ending May 31, were shown to be $375,140, as compared with $401,885 in 1911. After meeting interest and other charges a balance of $46,566 was carried forward to the credit of profit and loss, making the total at credit at the end of the fiscal year, $406,737. The president, Mr. T. J. Drummon, in his report to the shareholders, explained the somewhat disappointing result of the year's operations as follows:

"The adverse conditions in the iron trade of the United States during the last half of 1911 continued throughout the first half of 1912, and resulted in large quantitie sof American pig iron being dumped into the Canadian market and sold at sacrifice prices. The corporation had naturlaly to compete or lose the trade, and the result of such nnusual competition has consequently affected the outcome of this year's operations; but your directors are pleased to report that the revival of the United States' iron trade has already resulted in an increased demand and advanced prices there, with the resulting falling off of shipments to Canada, so that the corporation has orders on its books for a very large tonnage of pig iron for immediate and future shipments, at remunerative prices."

As to the future for the pig iron ore department, Mr. Drummond stated that with American furnaces gradually coming into operation again, the corporation has already booked contracts for a considerable tonnage of ore, for immediate and future shipment, not only to the United States, but to Great Britain and Germany.

s to the foundry department, he said: "The business of the iron foundries at Fort William, Hamilton, St. Thomas, Midland, Three Rivers, and Londonderry, shows a constant and very healthy growth, and despite the effects of American competition, on the profits for 1911-1912, a yearly tonnage production is now being obtained in all departments, that ensures the permanent suyremacy of the corporation in its special field of operation, from foundry pig iron to the finished product of railway and tramway car wheels, cast iron, water and gas pipes, and general castings. The actual volume of foundry trade exceeded that of the previous year by 23 per cent., and the opening months of the current year showed a still greater increase. The balance sheet of the corporation for the year shows total assets of $15,229,955, as compared with $14,602,765 a year ago."

BEAVER DIVIDENDS.

The directors of the Beaver Consolidated mines, at their regular meeting on Saturday, declared a three per cent. interim dividend, payable on December 21st to stock on record December 9. This is the first disbursement made since last July, but is the third for the year to date. The record is as follows:

	P.C.	Amount.
1911—May 15	2½	$45,000
—Aug. 31	3	60,000
—Dec. 15	3	60,000
1912—April 20	3	60,000
—July 15	3	60,000
—Dec. 21	3	60,000
Totals	17½	$345,000

IMPROVEMENTS AT THE COPPER CLIFF SMELTER.

During the past eighteen months extensive and important improvements and additions have been made to the plant of the Canadian Copper Company's reduction works at Copper Cliff. In a paper contributed to the Canadian Mining Institute last spring, Mr. David H. Browne outlined some of the changes that had then been made, referring more particularly to the substitution of basic for acid converters and to the provision of reverberatory furnaces to treat the flue dust. Since then the new plant has been in steady operation and has afforded the best possible results. Thus the tonnage now being produced from the basic converters, of from 110 to 120 tons daily from the treatment of from 400 to 500 tons of 20 per cent. matte, is said to constitute a world's record; while, notwithstanding that wages have advanced 25 per cent., and, since a greater tonnage of ore is being mined and treated, the average value of the ores smelted are lower, the reduction costs have been maintained at about the same level as last year. It is interesting, moreover, to note that before relining was necessary in the last occasion, the converters had treated 6,700 tons of material.

The two new reverberatory furnaces are, meanwhile, treating daily about 140 tons of flue dust and green fines, and 250 tons of hot slag. The coal charge is almost an infusible mixture. The company is now installing four Wedge roasters, and a third reverberatory, slightly different in design to those now in use, is being built.

Although event at present in point of metallic output the Canadian Copper Company is the most important undertaking of its class in the Dominion; in respect of tonnage treated it is second to the Granby Company, in the Boundary district. The present tonnage smelted represents from 1,800 to 2,000 tons daily, producing about 3,500 tons of matte a month; but next year, when four additional blast furnaces are provided, this will be increased to 4,000 tons daily, which is about what is accomplished at the Granby smelter when working at full capacity.

The basic converters are 37 feet 2 inches long by 10 feet in diameter, outside measurement; and turn on four tread rings 12 feet in diameter. The tuyerers number 44, and are 7 inches apart, but none is directly under the stack. The length inside the lining is 34 feet 3 inches; the bottom is 2 feet thick; the back or tuyere wall is 18 inches and the front 15 inches thick. The converters have two openings or spouts in the front wall opposite to but above the tuyere line, and the shell is turned down to pour slag or matte or turned back to blow by means of two wire ropes surrounding the shell on either side of the central stack. The converters are lined with magnesite bricks. The initial change is about 60 tons of furnace matte, additions being made as the slag is poured off, until finally there remains in the converter from seventy to eighty tons of finished product, which may represent from 300 to 400 tons of furnace matte. Mr. Browne points out that the basic converter has several advantages over the acid converter, among which are: the units are much larger, which simplifies the problem of dealing with large quantities of matte; no material is "slopped out" of the converter during the blow and so less furnace matte is required to produce a ton of Bessemer matte; the slag is lower in silica, thus effecting economy of flux; and, in general, the operation of converting is simplified.

STATISTICS AND RETURNS

ONTARIO RETURNS.

Returns to the Bureau of Mines for the 9 months ending 30th September, 1912, show the production of metals and metalliferous substances in Ontario to have been as follows:

Product.	Quantity.	Value.
Gold, oz.	53,488	$1,117,335
Silver, oz.	22,231,451	12,707,826
Copper, tons	8,019	1,142,076
Nickel, tons	15,907	3,368,437
Iron ore, tons	37,265	101,284
Pig iron, tons	452,021	6,051,978
Cobalt in crude material, lbs.	209,899	57,614
Cobalt and nickel oxides, lbs.	711,180	176,786
White arsenic, lbs.	2,944,104	66,316

Gold.—The gold mines of Porcupine began to produce bullion during the summer, and their output bids fair to assume important dimensions. The yield of gold for the first nine months of 1912 is more than double in value that of any preceding twelve months. The bulk was from the Hollinger and Dome mines. Other contributors were the McIntyre and Vipond at Porcupine, and the St. Anthony at Sturgeon Lake. The Cordova mines in Hastings county and the Olympia at Lake of the Woods also turned out bullion.

Silver.—As compared with the corresponding period of 1911, the production was [illegible] ounces less in quantity, but $1,114,090 more in value, silver being now much higher in price than last year. The productivity of the silver mines of Cobalt is being well sustained. The shipments comprised 15,408 tons ore, 7,859 tons concentrates, and $2,239,124 in bullion. South Lorrain contributed 616,092 ounces to the total, and Gowganda 449,281 ounces.

Nickel and Copper.—The mines of the Sudbury district yielded 15,907 tons of nickel, as compared with 12,711 tons during the same period last year, and 8,019 tons of copper, as against 6,769 tons. Both these metals are estimated in the form of Bessemer matte produced by the blast furnaces, constituting together about 80 per cent. of the matte by weight. A source of nickel ore quite outside the Sudbury region has been opened in the Alexo mine on the line of the Temiskaming & Northern Ontario Railway, from which a quantity of ore was shipped to the smelters of the Mond Nickel Company at Victoria Mines.

Iron.—Considerably less iron was shipped during the nine months of 1912 than during the same period of last year, the reduction amounting to 135,603 tons. The Helen mine was the principal producer. On the other hand, the output of pig iron shows a large increase, being 452,021 tons, as against 296,856 tons last year.

Cobalt By-products.—The refining works in Ontario produce arsenic, cobalt crude material or residues, and the oxides of nickel and cobalt. Shipments amounted in value to $300,716, as compared with $125,907 for the corresponding period of 1911. Both the European and American market for cobalt oxides are now for the most part supplied by the product made from the ores of Cobalt.

DOMINION STEEL FOR OCTOBER.

The Dominion Iron & Steel Co. made several new records during October. The output of pig iron, blooms and rods and coke is considerably in excess of that for any previous month. The figures for the wire and nail mill are not yet available, but it is certain that both have established records.

The shipments, while well up to the average, are some 3,000 tons below the record. The blowing in of the new No. 8 blast furnace is responsible principally for the increased output. Following are the figures:

Pig iron, tons	31.090
Steel ingots, tons	29.975
Bloom, tons	27.880
Rails, tons	15,656
Rods, tons	8,868
Coke, tons	50.540
Total shipments, tons	29.360

COBALT SHIPMENTS.

Shipments for the week ending November 9th were almost three times those of the previous week. Eleven mines sent out 19 cars during the week and of the consignment every car contained high grade ore. Coniagas led with six cars, averaging one each day, with La Rose, McKinley-Darragh, and Beaver each contributing two cars towards the total.

Wettlaufer, of South Lorrain, appears with one car shipment. The Nipissing sent out a car of concentrates to Denver. The week's total forms a new record from the camp this year and was as follows:

	High.	Lbs.
Hudson Bay	1	61,800
La Rose	2	132.000
Cobalt Lake	1	41.400
Coniagas	6	400.760
McKinley-Darragh	2	126.088
Nipissing	1	63.250
Trethewey	1	53.000
Beaver	2	128.752
Temiskaming	1	71.924
O'Brien	1	63.600
Wettlaufer	1	60,495
Totals	19	1,205,069

B. C. ORE SHIPMENTS.

Ore production in the Kootenay and Boundary districts for the week was 55.612 tons and for the year 2.115.261 tons. Smelter receipts for the week were 49.947 tons, for the year 1.896.937 tons.

Nelson.

Hudson Bay	34	708
Second Relief	31	72
Yankee Girl	33	50
Granite-Poorman, milled	250	11,850
Mother Lode, milled	500	9.750
Queen, milled	490	14.700
Molly Gibson, milled	300	6.900
Other mines	...	9.241
	1,638	53,271

Boundary.

Granby	28,855	1.067.761
Mother Lode	6,956	315,093
Unnamed	165	9.957
Rawhide	6,475	206,921
Napoleon	921	9,790
Ben Hur	35	35
Cavanaugh	1	1

United Copper	33	1,306
Surprise	160	4,242
Knob Hill	51	1,661
Nickel Plate, milled	1,500	64,100
Jewell, milled	200	17,400
Other mines	...	28,598
Total	45,352	1,726,865

Rossland.

Inland Empire	22	44
Centre Star	3,055	133,030
Le Roi No. 2	750	22,019
Le Roi	1,115	39,031
Le Roi No. 2, milled	300	8,000
Inland Empire, milled	90	1,620
Other mines	...	307
Total	5,332	204,051

Slocan and Ainsworth.

Bluebell	383	2,130
Silver Hoard	33	154
Utica	42	458
Rambler-Cariboo	72	834
Richmond Eureka	30	1,171
Whitewater	29	874
Standard, milled	400	15,200
Bluebell, milled	200	3,100
Van Roi, milled	1,100	49,200
Other mines	...	20,005
Total	2,289	93,276

East Kootenay.

Monarch	36	1,175
Sullivan	630	26,056
Monarch, milled	425	9,850
Other mines	...	717
Total	1,091	37,798

B. C. Copper Co.'s Receipts.
Greenwood, B.C.

Mother Lode	6,956	315,093
Unnamed	165	9,957
Rawhide	6,475	206,921
Napoleon	921	9,790
Other mines	...	18,374
Total	14,517	560,135

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	28,855	1,067,761

Consolidated Co.'s Receipts.
Trail, B.C.

Sullivan	630	26,056
Utica	42	458
Rambler-Cariboo	72	384
Richmond-Eureka	30	1,171
Knob Hill	51	1,061
Centre Star	3,055	133,030
Le Roi No. 2	750	22,019
Le Roi	1,115	39,034
Whitewater	29	874
Monarch	36	1,175
United Copper	33	1,306
Yankee Girl	33	50
Surprise	160	4,242
Bluebell	383	2,130
Hudson Bay	34	708
Silver Hoard	33	154
Second Relief	31	72
Inland Empire	22	41
Ben Hur	35	35
Cavanaugh	1	1
Other mines	...	33,972
Total	6,575	269,071

N. S. STEEL AND COAL.

The Nova Scotia Steel & Coal Co. made a record output of coal during October, the figures being 79,000 tons mined and 81,000 tons shipped.

Ore mined was 57,000 tons; pig iron produced 7,800 tons; steel output, 9,200 tons. The steel production was one of the best for years.

SILVER PRICES.

	New York, cents.	[illegible] pence.
Oct. 23	[illegible]	[illegible]
" 24	[illegible]	[illegible]
" 25	63	[illegible]
" 26	[illegible]	[illegible]
" 28	63	29 1/16
" 29	63 1/4	29 3/16
" 30	62 7/8	29
" 31	62 7/8	29
Nov. 1	62 1/2	[illegible]
" 2	62 1/2	29
" 4	62 7/8	29
" 5	[illegible]	[illegible]
" 6	[illegible]	[illegible]
" 7	62 7/8	29

TORONTO MARKETS.

Nov. 11.—(Quotations from Canada Metal Co., Toronto):
- Spelter, 6.35 cents per lb.
- Lead, 5.25 cents per lb.
- Tin, 12 cents per lb.
- Antimony, 52 cents per lb.
- Copper, casting, 18½ cents per lb.
- Electrolytic, 18½ cents per lb.

Nov. 11.—Pig Iron—(Quotations from [illegible] Toronto):
- Summerlee No. 2, $23.00 (f.o.b. Toronto).
- Midland No. 1, $22.00 to $22.50 (f.o.b. Toronto).
- Midland No. 2, $21.50 to $22.00 (f.o.b. Toronto).

General Markets.

- Coal, anthracite, $5.50 to $6.75 per ton.
- Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Nov. 7.—Connellsville Coke (f.o.b. ovens):
- Furnace coke, prompt, $4.00 to $4.25 per ton.
- Foundry coke, prompt, $4.25 to $4.50 per ton.

Nov. 7.—Tin, Straits, 50.25 cents.
- Copper, Prime Lake, 17.50 to 17.65 cents.
- Electrlytic Copper, 17.39½ cents.
- Copper Wire, 19.00 cents.
- Lead, 4.75 to 4.80 cents.
- Spelter, 7.50 cents.
- Sheet Zinz (f.o.b. smelter), 9.00 cents.
- Antimony, Cookson's, 10.37½ cents.
- Aluminum, [illegible] cents.
- Nickel, 45.00 cents.
- Platinum, ordinary, [illegible] per ounce.
- Platinum, hard, $48.00 per ounce.
- Bismuth, $2.00 to $2.25 per pound.
- Quicksilver, [illegible] per [illegible] flask.

PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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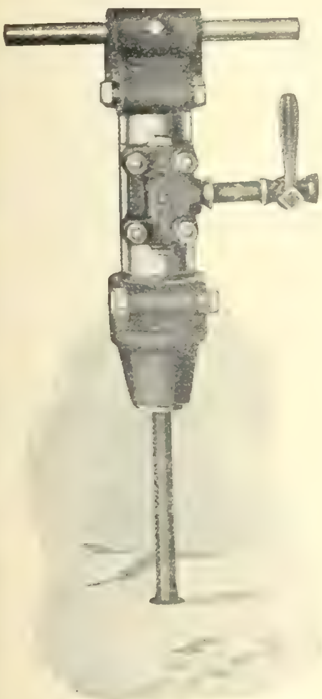

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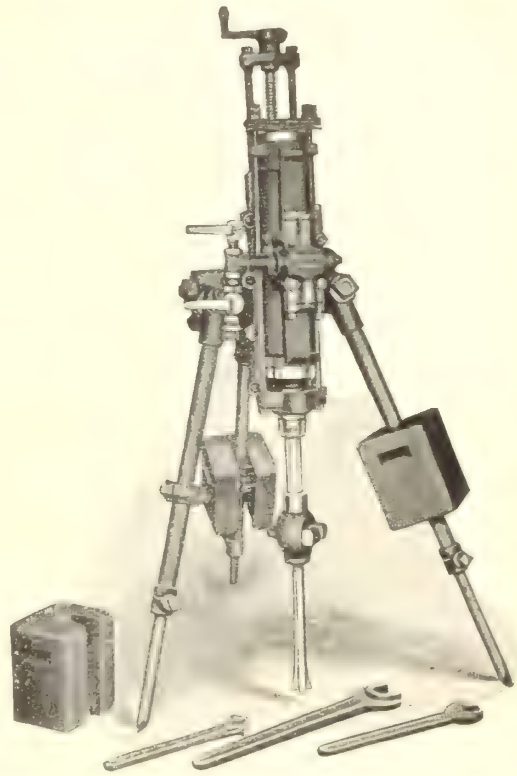

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Allis-Chalmers-Bullock Co.
McKiernan-Terry Drill Co.
Laurie & Lamb.
Canadian Westinghouse.
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Peacock Bros.
Canada Foundry Co., Ltd.
Walker Brothers.

Concentrators and Jigs—
American Grandal Co.
Deister Machine Co.
Fraser & Chalmers, Ltd.
Jenckes Machine Co.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock.
James Ore Concentrator Co.
Mussens, Limited.
Canadian Fairbanks-Morse Co.
Chalmers & Williams.

Concrete Mixers—
John McDougall Caledonian Iron Works Co.
Peacock Brothers.
Jeffrey Mfg. Co.
Mussens, Limited.

Condensers—
Allis-Chalmers-Bullock.
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works, Co., Ltd.
Smart-Turner Machine Co., Ltd.
Peacock Brothers.
Laurie & Lamb.

Converters—
Allis-Chalmers-Bullock, Ltd.
Canadian Westinghouse.
Fraser & Chalmers, Ltd.
Mussens, Limited.

Conveyors—Belt—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
Jeffrey Mfg. Co.
C. O. Bartlett & Snow Co.
Jenckes Machine Co.
Peacock Brothers.
Mussens, Limited.
Waterous Engine Works.
Canadian Fairbanks-Morse Co., Ltd.

Cranes—
Smart-Turner Machine Co.
Peacock Brothers.
Mussens, Limited.
Canadian Fairbank-Morse Co., Ltd.
M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
Thos. & Wm. Smith.
B. Greening Wire Co., Ltd.

Crushers—
Allis-Chalmers-Bullock Co.
Fraser & Chalmers, Ltd.
Jeffrey Mfg. Co.
Jenckes Machine Co.
Peacock Bros.
Lymans, Limited.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Hadfields Steel Foundry Co.
Chalmers & Williams.
C. O. Bartlett & Snow Co.

Cyanide Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
Roessler & Hasslacher.
Mussens, Limited.
Thomas & William Smith.
Chalmers & Williams.
Peacock Brothers.

Derricks—
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.
Mussens, Limited.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith & Travers.

Dredging Machinery—
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock Co., Ltd.
John McDougall Caledonian Iron Works Co., Ltd.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Limited.
C. O. Bartlett & Snow Co.

Dredging Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.
B. Greening Wire Co., Ltd.

Driers—
Jeffrey Mfg. Co.
Mussens, Limited.
C. O. Bartlett & Snow Co.

Drills, Air and Hammer—
Can. Ingersoll-Rand Co., Ltd.
Mussens, Limited.
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Peacock Brothers.
Canada Foundry.

Drills—Core—
Can. Ingersoll-Rand Co., Ltd.
McKiernan-Terry Drill Co.
Standard Diamond Drill Co.
Mussens, Limited.
Canada Foundry.

Drills—Diamond—
American Diamond Rock Drills.
Sullivan Machinery Co.

Drill Steel Sharpeners—
Canadian Ingersoll-Rand Co.

Drills—Electric—
Jeffrey Mfg. Co.
Mussens, Limited.
Siemens Brothers. Dynamo Works, Ltd.
Canadian Ingersoll-Rand Co.

Dumps—
Sullivan Machinery Co.
Waterous Engine Works Co.
Jeffrey Mfg. Co.
Mussens, Limited.

Dynamite—
Curtis & Harvey (Canada), Limited.
Canadian Explosives.

Dynamos—
Can. Westinghouse Co.
Can. Fairbanks-Morse Co.
Peacock Brothers.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.

Ejectors—
Mussens, Limited.
Peacock Bros.

Elevators—
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Allis-Chalmers-Bullock Co.
John McDougall Caledonian
C. O. Bartlett & Snow Co.
Waterous Engine Works.
Jenckes Machine Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
S. Flory Mfg. Co.
Peacock Brothers.

Elevator Buckets—
Mussens, Limited.
C. O. Bartlett & Snow Co.

Engineering Instruments—
C. L. Berger & Sons.
W. F. Stanley & Co.
Peacock Bros.

Engineers and Contractors—
Fraser & Chalmers, Ltd.

Engines—Automatic—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.
Waterous Engine Works Co.

Engines—Gas and Gasoline—
Fraser & Chalmers, Ltd.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.
Peacock Bros.
M. Beatty & Sons.
Canadian Westinghouse.

Engines—Haulage—
Fraser & Chalmers, Ltd.
Peacock Bros.
E. Leonard & Sons.
Jenckes Machine Co.
C. O. Bartlett & Snow Co.

Engines—Marine—
Smart-Turner Machine Co.
Jenckes Machine Co.
Peacock Bros.

Engines—Oil—
Jenckes Machine Co.
Peacock Bros.

Engines—Steam—
E. Leonard & Sons.
Fraser & Chalmers, Ltd.
Allis-Chalmers-Bullock.
Smart-Turner Machine Co.
Robb Engineering Co.
S. Flory Mfg. Co.
Jenckes Machine Co.
Alex. Fleck.
Peacock Bros.
M. Beatty & Sons.
Laurie & Lamb.
Mussens, Limited.
Can. Fairbanks-Morse Co.

Engines—Traction—
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Sullivan Machinery Co.
Jeffrey Mfg. Co.
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Allis-Chalmers-Bullock.
Mussens, Limited.

Feeders—Ore—
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Mussens, Limited.
Allis-Chalmers-Bullock, Ltd.
C. O. Bartlett & Snow Co.

Filters—
John McDougall Caledonian Iron Works.

Forges—
Mussens, Limited.
Can. Fairbanks-Morse Co., Ltd.

Forgings—
M. Beatty & Sons.
John McDougall Caledonian Iron Works.
Canadian Cleveland Drill Co.
Smart-Turner Machine Co.
Peacock Brothers.
Canadian Steel Foundries.

Furnaces—Assay—
Lymans, Limited.
Mussens, Limited.

Fuse—
Peacock Brothers.
Curtis & Harvey (Canada), Limited.
Canadian Westinghouse.
Canadian Explosives.
Mussens, Limited.

Gears—
Canadian Westinghouse.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Brothers.
Jeffrey Mfg. Co.
C. O. Bartlett & Snow Co.

Generators—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Brothers.

Continued on page 36.

Canadian Miner's Buying Directory.—(Continued from page 34.)

Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.

Galvanized Strand—
B. Greenings Wire Co., Ltd.
Fraser & Chalmers, Ltd.

Girders—Steel—
Dominion Bridge Co.

Hangers—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Heaters—Feed Water—
Mussens, Limited.
Laurie & Lamb.
E. Leonard & Sons.
Canadian Westinghouse.
Peacock Bros.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

High Speed Steel Twist Drills—
Mussens, Limited.

Hoists—Air, Electric and Steam—
Can. Ingersoll-Rand Co., Ltd.
Peacock Bros.
Mussens, Limited.
Allis-Chalmers-Bullock.
S. Flory Mfg. Co.
Jones & Glassco.
Waterous Engine Works.
Jenckes Machine Co., Ltd.
M. Beatty & Sons.
Jeffrey Mfg. Co.
Canada Foundry.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.

Hoisting Engines—
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry Co.
Can. Fairbanks-Morse Co.
Siemens Brothers. Dynamo Works, Ltd.
Sullivan Machinery Co.
Fraser & Chalmers, Ltd.
Canadian Ingersoll-Rand Co.
C. O. Bartlett & Snow Co.

Hoists—Gas and Gasoline—
Mussens, Limited.
Waterous Engine Works.

Hoisting Ropes—
Allan, Whyte & Co.
Fraser & Chalmers, Ltd.

Hose—
H. W. Johns-Manville Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Can. Cleveland Drill Co.

Injectors—
Mussens, Limited.
Peacock Bros.

Jacks—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Jigs—
Mussens, Limited.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Lamps—Acetylene—
Mussens, Limited.
Fraser & Chalmers, Ltd.

Lamps—Arc—
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Lamps—Safety—
Canadian Explosives.
John Davis & Son.
Peacock Bros.
Ackroyd & Best.
Siemens Brothers. Dynamo Works, Ltd.

Levels and Rules—
C. L. Berger & Co.
John Davis & Sons.

Lights—Mine Bldg—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Link Belt—
Watrous Engine Works.
Jones & Glassco.

Locomotives—Compressed Air—
Mussens, Limited.
Canadian Westinghouse.

Locomotives—Electric—
Mussens, Limited.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Siemens Brothers. Dynamo Works, Ltd.

Locomotives—Steam—
Mussens, Limited.
Canadian Westinghouse.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell Sons & Co.
Consolidated Mining & Smelting Co. of Canada.
Canada Metal Co.

Monel Metal—
Orford Copper Co.

Motors—
Mussens, Limited.
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Canadian Westinghouse.
Peacock Brothers.
Jones & Moore.
Siemens Brothers. Dynamo Works, Ltd.
Allis-Chalmers-Bullock, Ltd.
C. O. Bartlett & Snow Co.

Nickel—
Can. Copper Co.

Ore Sacks—
Can. Bag Co.
Can. Fairbanks-Morse Co.

Ore Samplers—
Can. Laboratories.
Campbell & Deyell.

Ore Testing Works—
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

Ores and Metals—Buyers and Sellers of—
Geo. G. Blackwell.
Consolidated Mining & Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Perforated Metals—
B. Greening Wire Co., Ltd.
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.

Pick Machines—
Sullivan Machinery Co.
Hardy Patent Pick.

Picks—Steel—
Mussens, Limited.
Hardy Patent Pick.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—Rivetted—
John McDougall Caledonian Iron Works.
Consolidated Mining & Smelting Co.
Peacock Bros.
Laurie & Lamb.
E. Leonard & Sons.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Mussens, Limited.
Smart-Turner Machine Co.

Pipe Fittings—
Can. H. W. Johns-Manville.
Mussens, Limited.
Can. Fairbanks-Morse Co.
Canadian Westinghouse.

Pneumatic Tools.
Can. Cleveland Drill Co.
Can. Ingersoll-Rand Co., Ltd.
Peacock Brothers.
Jones & Glassco.

Producer—Gas—
Mussens, Limited.
E. Leonard & Sons.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Mussens, Limited.
Can. Fairbanks-Morse Co.
American Diamond Rock Drill.
Allis-Chalmers-Bullock, Ltd.
Fraser & Chalmers, Ltd.

Pulleys, Shaftings and Hangings—
E. Leonard & Sons.
Smart-Turner Machine Co.
Jeffrey Mfg. Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pielsometers—
Mussens, Limited.
Can. Fairbanks-Morse Co.

Pumps—Boiler Feed—
Mussens, Limited.
E. Leonard & Sons.
Smart-Turner Machine Co.
Peacock Bros.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Centrifugal—
Alex. Fleck.
Mussens, Limited.
E. Leonard & Sons.
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Fraser & Chalmers, Ltd.

Pumps—Electric—
E. Leonard & Sons.
Mussens, Limited.
Jeffrey Mfg. Co.
Allis-Chalmers-Bullock, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pumps—Pneumatic—
E. Leonard & Sons.
Mussens, Limited.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.

Pumps—Rotary—
E. Leonard & Sons.

Pumps—Sinking—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works, Ltd.
Canadian Ingersoll-Rand Co.

Pumps—Steam—
Canadian Rand Co.
Mussens, Limited.
Thos. & Wm. Smith.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Alex. Fleck.

Pumps—Turbine—
Mussens, Limited.
E. Leonard and Sons.
Smart-Turner Machine Co.
Canada Foundry Co.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.

Pumps—Vacuum—
E. Leonard & Sons.
Smart-Turner Machine Co.

Quarrying Machinery—
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

Roasting Plants—
Allis-Chalmers-Bullock.
Fraser & Chalmers, Ltd.

Rolling Mill Machinery—
Peacock Brothers.

Rolls—Crushing—
Mussens, Limited.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.

Roofing—
Paterson Mfg. Co.
Dominion Bridge Co.
Mussens, Limited.
Metallic Roofing.
Can. H. W. Johns-Manville Co.

Rope—Manilla and Jute—
Jones & Glassco.
Mussens, Limited.
Allis-Chambers-Bullock.
Peacock Bros.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Rope—Wire—
B. Greening Wire Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.
Fraser & Chalmers, Ltd.

Samplers—
Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Sons.
Campbell & Deyell.

Scales—
Can. Fairbanks-Morse Co.
Peacock Bros.
Thos. & Wm. Smith.

Screens—
Mussens, Limited.
Jeffrey Mfg. Co.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
B. Greening Wire Co.
Allis-Chalmers-Bullock.
Peacock Bros.
Waterous Engine Co.
Chalmers & Williams.
Fraser & Chalmers, Ltd.
C. O. Bartlett & Snow Co.

Separators—
E. Leonard & Sons.
Canada Foundry Co., Ltd.
Wetherell Magnetic Separating Co.
Smart-Turner Machine Co.
Peacock Brothers.

Separators—Magnetic—
American Grondal Co.
Wetherill Magnetic Separating Co.

Shovels—Steam—
Mussens, Limited.
M. Beatty & Sons.

Slime Tables—
Deister Concentrator Co.
James Ore Concentrator.
Canada Foundry.
Chalmers & Williams.

Smelting Machinery—
Mussens, Limited.
Allis-Chalmers-Bullock.
Peacock Brothers.
Fraser & Chalmers, Ltd.

Smelters & Refiners—
Consolidated Mining & Smelting Co.

Stamp Mills—
Mussens, Limited.
Allis-Chalmers-Bullock.
Can. Fairbanks-Morse Co.
Jenckes Machine Co.
Peacock Brothers.
Canada Foundry.
Chalmers & Williams, Inc.
Fraser & Chalmers, Ltd.

Steel Drill—
Sullivan Machinery Co.
Canadian Rand Co.
Peacock Bros.

Steel—Manganese—Castings—
Peacock Bros.
Hadfield's Steel Foundry Co.
Can. Steel Foundries.

Steel—Tool—
Mussens, Limited.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
N. S. Steel & Coal Co.

Steel—Structural—
Dominion Bridge Co.

Surveying Instruments—
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W. F. Stanley.
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Switchboards—
Canadian Westinghouse.
Allis-Chalmers-Bullock.
Siemens Brothers. Dynamo Works, Ltd.

Tanks—Cyanide, Etc.—
Mussens, Limited.
E. Leonard & Sons.
John McDougall Caledonian Iron Works.
Peacock Bros.
Fraser & Chalmers, Ltd.

Terminals—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Tramways—
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B. Greening Wire Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.

Transformers—
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Canadian Westinghouse.
Can. Fairbanks-Morse Co.
Peacock Bros.
Siemens Brothers. Dynamo Works, Ltd.

Transits—
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Peacock Bros.

Tube Mills—
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Allis-Chalmers-Bullock.
Peacock Bros.
Canada Foundry.
Chalmers & Williams.
Fraser & Chalmers, Ltd.

Turbines—
Allis-Chalmers-Bullock.
Canadian Westinghouse.
Peacock Bros.
Laurie & Lamb.
Canada Foundry.
Jenckes Machine Co.
Siemens Brothers. Dynamo Works, Ltd.
John McDougall Caledonian Iron Works, Ltd.
Fraser & Chalmers, Ltd.
Robb Engineering Co., Ltd.

Water Wheels—
Allis-Chalmers-Bullock.
John McDougall Caledonian Iron Works.
Jenckes Machine Co.

Wheels—
Mussens, Limited.
Jeffrey Mfg. Co.

Winding Engines—
Waterous Engine Works.
Mussens, Limited.
Canada Foundry Co.
Allis-Chalmers-Bullock.
Jenckes Machine Co.
Peacock Brothers.
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers, Ltd.
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Siemens Brothers Dynamo Works, Ltd.
C. O. Bartlett & Snow Co.

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B. Greening Wire Co.

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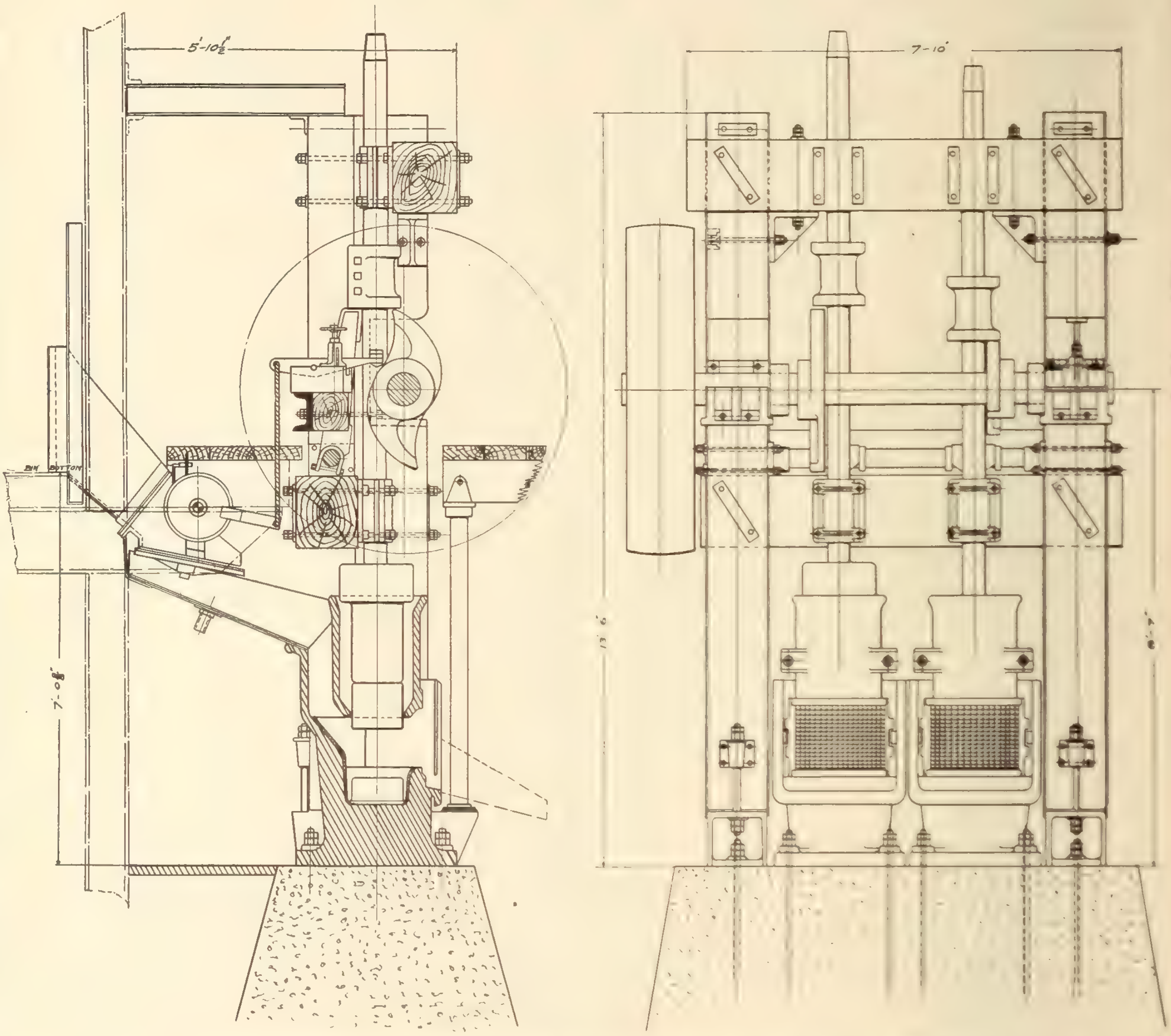

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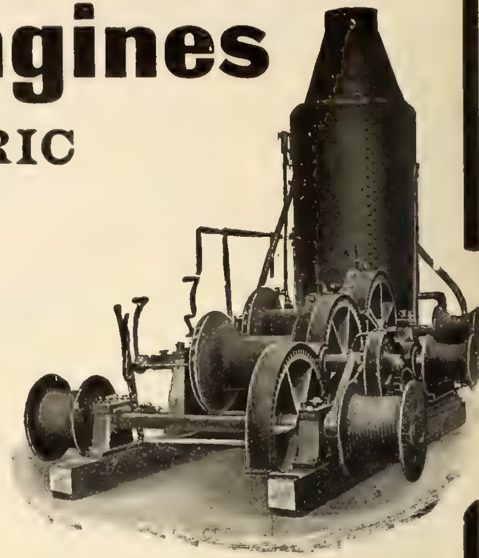

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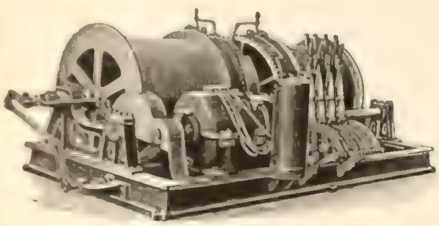

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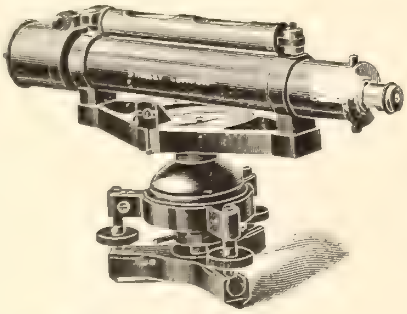

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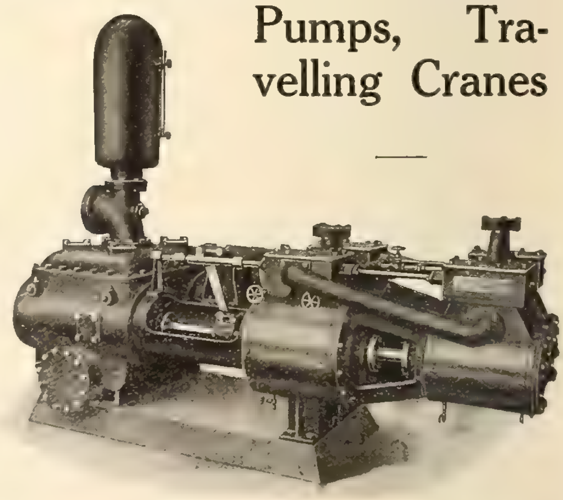

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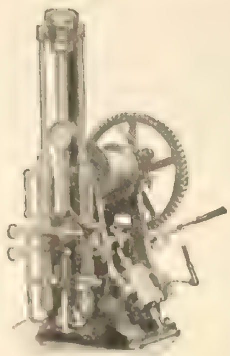

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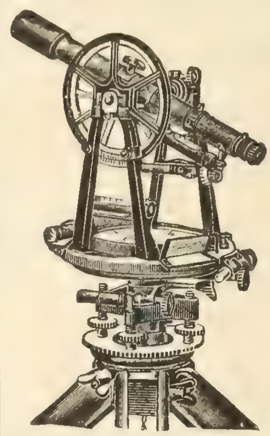

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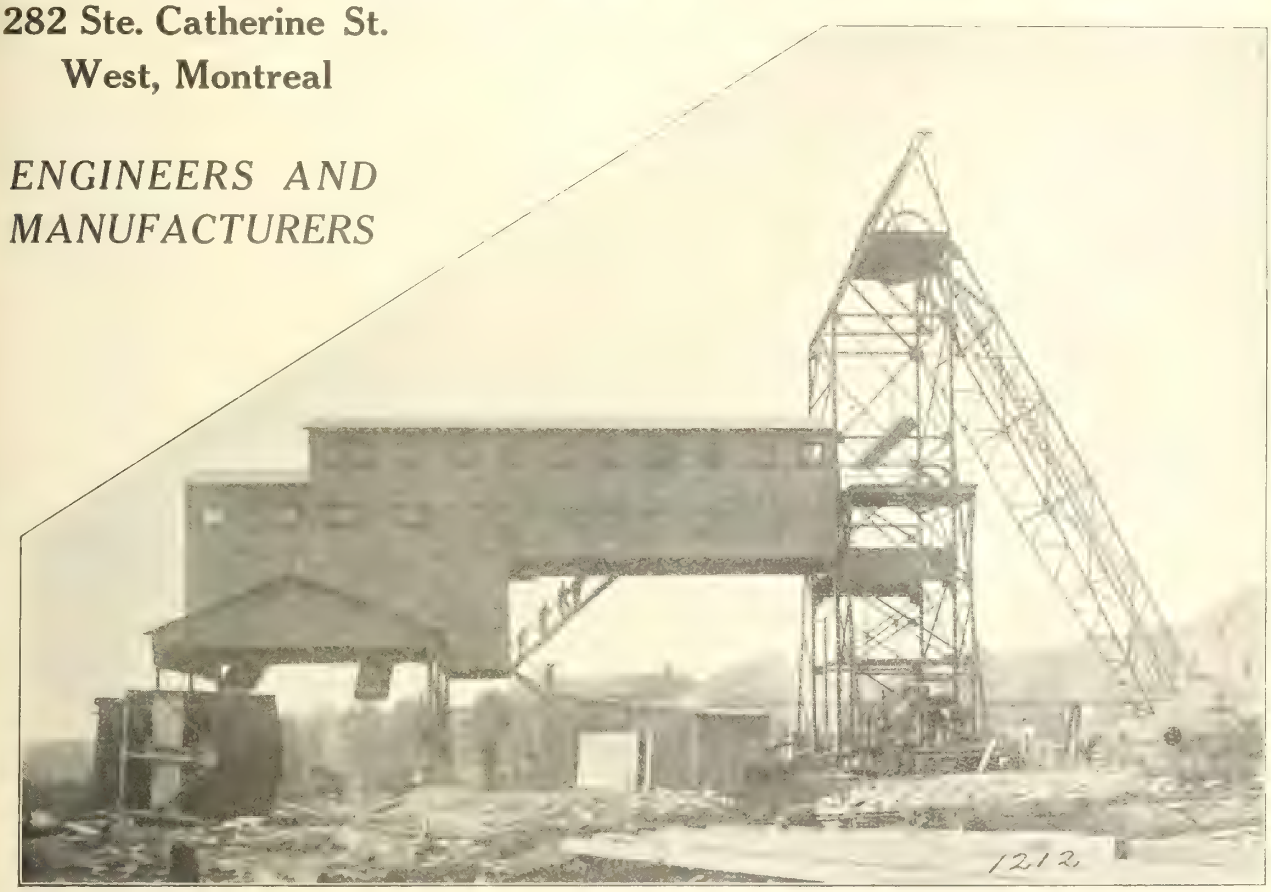

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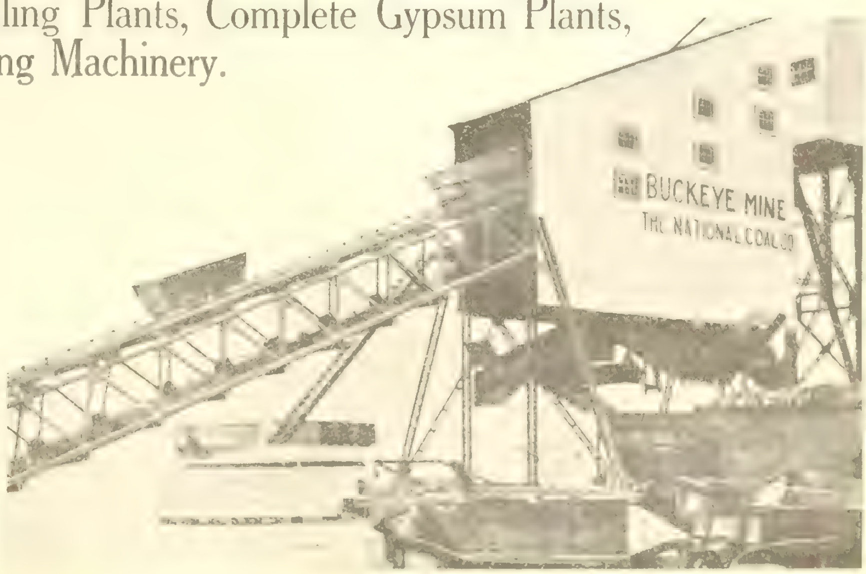

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Per ....
Gen. Construction Engineer

The Holman Drill on Quarry Work near Montreal

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Per.............. ....
General Construction Engineer

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THE CANADIAN MINING JOURNAL

VOL. XXXIII. TORONTO, December 1, 1912. No. 23

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879.'

CONTENTS.

A DOMINION EXPLOSIVES ACT.

The urgent need of stringent Government control of the manufacture of explosives was never more apparent. Although the whole matter has been exhaustively investigated by the Mines Branch of the Department of Mines, Ottawa, and although a bill was drafted more than a year ago, yet no further action has been taken. Dominion and Provincial officials are of one mind as to the pressing necessity of immediately enacting suitable laws, yet, for some inexplicable reason, nothing is being done.

Let us glance for a moment over the fatalities that have occurred within the last 18 months. On April 27th, 1911, in an explosion in the drying house of the Dominion Explosives Company at Sand Point, Ontario, four lives were lost. On September 24th, of the same year, in a packing house of the Canadian Explosives Company, at Beloeil, Quebec, one man was killed and four injured. Three of the injured died a short time after the explosion. Four more lives were lost, on October 19th, in a explosion in the mining house of Curtis & Harvey, Limited, at Rigaud, Quebec. Three men were killed and three injured on December 19th, 1911, in the gelignite mixing house of the Canadian Explosives Company, Limited, near Nanaimo, British Columbia.

This gives the shocking total of 15 lives lost and four men injured in the manufacture of explosives in Canada in 1911, surely too large a toll to be easily explained away.

During the current year a very serious accident occurred at the factory of the Energite Explosives Company at Haileybury, Ontario, which resulted in the death of six persons, and the injury of three.

Thus within 18 months there has been a total loss of life of 21 persons with the serious injury of seven others.

These casualties are directly attributable to lack of proper control of the manufacture of explosives. But the matter does not end here. The same causes that bring about these accidents are responsible for many other fatalities and minor accidents. The users of inferior explosives are in constant danger. While it is impossible to determine and unfair to guess how many mining and railway construction fatalities may be set down to poor explosives, yet no one at all acquainted with Canadian conditions can deny that rigid inspection and adequate legislation would materially reduce the number of accidents.

In addition to recorded accidents in the metalliferous mines of Canada, there are numerous unrecorded casualties in railway construction and other public works. Many of these arise through ignorant handling; but

even these could be minimized if our explosives were all they should be. In other parts of the British Empire where manufacturers are amenable to law and where conditions of manufacture are standardized, accidents in mines from explosions are relatively rare. In Canada the explosives' accidents account often for 50 per cent. of the total mining fatalities. This is certainly not to our credit.

The Dominion Government in 1910 secured the services of Captain Arthur Desborough, H.M. Inspector of Explosives, to make a thorough investigation of the explosives industry throughout Canada. On his exhaustive report was based the bill, referred to above, which was submitted to the House of Commons during the session 1910-11. It has not yet become law. Without question the passage of this bill should be the first duty of the present Government.

THE BELLEVUE EXPLOSION.

Our readers will remember that in a letter published in these columns last February, Mr. Robert Coulthard took exceedingly strong exception to Mr. J. G. S. Hudson's diagnosis of the Bellevue explosion and to certain of his statements of fact.

An article published in "Coal Age," Octoer 5, reprints in part the conclusions of Messrs. John T. Stirling and John Cadman. Microscopic examination of the roof rock from the Bellevue mine showed it to be siliceous with a bituminous cement. It has also been demonstrated that sparks are often generated by falls of rock from the roof. There is little need of pointing out the possibilities of a fall of rock in the presence of an explosive admixture of gas and air. In a general way this confirms Mr. Hudson's report.

THE PORCUPINE STRIKE.

The latest information before going to press concerning the labour troubles in Porcupine is encouraging. The struggle is centering round the Dome and the Hollinger. At both mines large numbers of men are at work. Not once during the strike has the Dome production fallen below 200 tons per day. This will soon be increased. It is expected, also, that the Hollinger output will presently become normal. Several smaller mines such as the McEnaney, Plenaurum, Vipond, and Jupiter are closed completely, and their operators are playing the part of interested spectators. It is patent that the men will not win.

Many newspaper stories about shooting affrays have been circulated. It is most unfortunate that the strikes have given actual cause for these reports. However, in the main, the strike has been conducted in an orderly manner.

For some time to come Porcupine will feel the effect of the present trouble, inasmuch as many of the best miners have left the camp not to return. This and the loss of time and wages is too high a price to pay for an easily avoidable holiday. As a matter of fact, the strike was totally unnecessary. Unquestionably the men, had they calmly discussed matters with the operators, without attempting to quit work, would have put themselves in a very much better light. It seems evident that the miners are under the domination of irresponsible and mischievous demagogues. Not otherwise can we account for their lack of wisdom.

We are convinced that men should be punished for precipitately striking before either formulating or discussing their demands. It is high time our labour legislation were given more positive application. A preventive, not a cure, is needed.

THE HOMESTAKE.

Few more interesting plants exist than that of the famous Homestake mine, a mine that has yielded nearly thirty millions of dollars to its fortunate owners.

An exhaustive description of the milling equipment and practice has just appeared in the latest bulletin of the Institution of Mining and Metallurgy. The paper is far too lengthy to summarize here, but there are a few salient points worthy of special mention.

Thirty years of steady productiveness "with an ore "uniformly of low grade and in a region of high wages "and high freight rates" is surely a proud record. Let us see how it is done.

The Homestake ore contains about $3.50 in gold. 72 per cent. of this gold is recovered as amalgam; 22 per cent. by cyanide; a total of 94 per cent. The crushings amount to 125,000 tons per month from 1,000 stamps. Much surface ore is won cheaply by means of glory holes and is profitably milled when it contains as small a quantity of gold per ton as $1.50. But the general average is as mentioned above.

The administration checks every possible source of waste, knows from hour to hour what is happening at the mine and mill, and carefully tabulates and records every significant item. For instance, the loss of mercury is regularly watched and allocated. It is known just how much is lost, where and how the loss occurs, and what each class of ore requires. In a similarly complee manner the operation of each successive process is exactly controlled and the cost segregated. It is almost impossible for even trifling losses to occur without the knowledge of the management. Stamp-milling costs between 27 and 35 cents per ton of ore, the lower figure being due to the use of electric power. Cyanide treatment costs not more than 21 cents per ton treated. Thus the total mill costs are from 48 to 56 cents per ton. Ore breaking costs about 6 cents per ton of ore. With exceptionally low mining costs it is evident that a handsome profit is made on $3.50 ore.

A few mill details may be mentioned here. The falling weight of each stamp is 900 pounds. The shoes are of special chilled cast iron, the dies of hard cast iron. Nearly all the cast iron parts are made at the company's foundry. The screens are needle-slot, corresponding to from 30- to 35-mesh wire. Inside amalgamation is practised, and there are also outside plates 12 feet long by 4½ feet wide. The mercury is fed hourly

at the rate of 0.13 oz. per ton of ore crushed. No violent methods, such as steaming or scraping with steel, are used on the plates. The amalgam is removed by brushing with small whisks or with stiff straw brooms. Every ten days the weight of amalgam obtained at each mill is reported and verified. Each retort holds 7,000 oz. of amalgam. The retorting is done over pine fires, and always commences at 3 p.m. Early next morning the retorts are opened and the bullion removed. In the four melting furnaces $130,000 in gold can be melted at one time.

EDITORIAL NOTES.

The American Smelting and Refining Company has taken several options in the Sudbury region. The ingestigation of the nickel deposits has been going on for several months under the direction of Mr. Kirby Thomas.

The versatility of the mining engineer was never given better illustration than during the present strike in Porcupine. At least one prominent mine manager took the place of the cook. Another became hoistman. Still another combined the duties of deckhand and machinist. It needs no flight of fancy to imagine what blisters came on unaccustomed hands.

Incorrect newspaper items have done injustice to the persons to whom belongs the credit of successfully developing the Seneca-Superior mine in Cobalt. Briefly, the person who controlled and defined the policy of the syndicate was Mr. W. E. Segsworth, of Toronto. Assisted by Mr. R. H. Lyman, Mr. Segsworth has brought the mine to its present condition.

Many shareholders will welcome the news that the royalties exacted by the Ontario Government from certain Cobalt mines are to be abolished or reduced. The Chambers-Ferland royalty (10 per cent. net) is to be wiped out entirely until such time as the company declares more than 10 per cent. per year dividend. With the Hargraves the same conditions obtain. The 25 per cent. gross royalty now payable by the O'Brien is at present the subject of negotiation.

It seems probable that every country in the world will have adopted a nickel coinage before steps are taken in this direction in Canada, the country that is the chief producer of this metal. The desirability of introducing a nickel currency in Australia, in place of copper, is now being considered, and the press of the Commonwealth is unanimously in favour of the change, while the Prime Minister has also expressed himself as favourable. As we have already suggested, Canada might make amends for dilatoriness by a show of originality in utilizing "Monel" metal, which is an actual product of the country, for coinage purposes.

A proposal to organize an international engineering congress to assemble at San Francisco in 1915 is now under consideration, the intention being to extend invitations to the Canadian Mining Institute, the Mexican Institution of Mining and Metallurgy, the Australian Institute of Mining Engineers, and other mining societies to participate. Presumably it is designed that the congress shall be held in conjunction with the Panama-Pacific Exposition in that year. The selection of date is, however, unfortunate, as it is already arranged that the next meeting of the International Mining Congress shall take place in London in 1915. To this the mining societies of the world are in a sense pledged. It would scarcely seem advisable, therefore, that there should be two international meetings of the same character in the same year. Nor is the present proposal quite fair to the International Mining Congress.

THE RELATION OF TRANSPORTION TO MINING IN COBALT

Written for the Canadian Mining Journal by A. A. Cole.*

Cobalt has always been fortunately situated regarding transportation facilities, owing to the fact that the railway reached the camp before the silver field was opened up; indeed the discovery of this rich mineral district may be traced directly to the railway construction.

The early operators were, therefore, freed from one of the usual sources of worry in the development of a new camp, and after they had mined the ore their chief anxiety was to obtain a market for their product. At first this did not seem a difficult matter, and a quantity of ore was taken for treatment by a New Jersey smelter. The complex nature of the ore at once proved a stumbling block and for months no ore was treated but finally a method of handling it was worked out, and shipments began. At this time none of the shipments remained in Canada for treatment, but all went to the United States. The rapidly increasing output of the mines and the richness of the ore, naturally attracted attention, and numbers entered this most inter-

*Mining Engineer T. & N. O. Ry.

esting metallurgical field. The result was that a number of Canadian smelters erected plants for the treatment of these ores. For a time the increase in ore production was greater than the increase in smelter capacity, but that time has passed, and the smelters are now looking for ore. At the present time most of the high grade ore is treated by these Canadian smelters, the balance going to the United States and to Europe.

In the early days the mining operator was dependent entirely on marketing his ore to the smelter, and it was simply a question of calculating the freight and smelter charges to find what ores would pay for shipment, and all below that point had to be held for a possible future treatment. The low grade ores were not seriously considered, but as time went on it was realized that these low grade ores were destined to play an important role in the life of Cobalt. As a consequence, mills sprang up rapidly, till now there are seventeen in the camp, and their operation has become a vital part of the industry. Through their operation thousands of tons of ore have become available for shipment, that previously could not be realized upon. During 1911 the low grade ore milled in Cobalt amounted to 382,000 tons, and from present appearapces this amount is likely to be materially increased in 1912.

The accompanying schedule shows the freight rates that have been in force for the last two years. On looking over these freight rates, it will be found that, considering the value of the shipments, the rates on high grade ore are very reasonable, but on low grade material the rates are comparatively high, which is a necessary consequence of the long hauls to the smelters.

Freight Rates on Silver Ores from Cobalt.

From Cobalt to North Bay—	per 100 lbs.
Below \$49.00 per ton	10 cents.
Above \$49.00 per ton, billed to Canadian points	14 cents.
Above \$49.00 per ton, billed to outside points	16 cents.

Silver Ore, Carloads, Minimum 30,000 lbs.

From North Bay to	Rate in cents per 100 lbs. A	B	C	D
Marmora, Ontario	18	20	27	34
Copper Cliff, Ontario	10	12	16	21
Orillia, Ontario	11	13	17	21
Thorold, Ontario	14	16	21	26
Toronto, Ontario	12	14	19	24
*Denver, Colorado, U.S.A.	40	46	54	62½

Application of Rates.

Group A.—Rates apply when valuation is under \$50 per net ton.

Group B.—Rates apply when valuation is under \$50 and under \$100 net ton.

Group C.—Rates apply when valuation is under \$100 and under \$500 net ton.

Group D.—Rates apply when valuation is under \$500 and over per net ton.

When shipments are made to Eastern United States points, a through rate is not quoted, but cars are billed to the frontier, to Buffalo, Black Rock, or Suspension Bridge, N.Y. From there new rates and ratings apply.

Silver Ore, Carloads, Minimum 40,000 lbs.

From North Bay to	Rate in cents per 100 lbs. A	B	C	D
Buffalo, Black Rock, or Suspension Bridge, N.Y., U. S. A.	12½	15	19½	24½

Application of Rates.

Group divisions A, B, C and D apply on same valuation as in previous table.

Silver Ore, Carloads, Minimum 50,000 lbs.

From Buffalo, Black Rock and Suspension Bridge, N.Y., to

	Rates in cents per 100 pounds. A	B	C	D
Bergen Junction, N.Y.	13	16	22	28
Carnegie, Pa.	10	11½	18	25½
Chrome, N.J.	13	16	22	28
Newark, N.J.	13	16	22	28
New York, N.Y.	13	16	22	28
Perth Amboy, N.J.	13	16	22	28

Group A.—Rates apply when valuation is under \$100 per net ton.

Group B.—Rates apply when valuation is over \$100 and does not exceed \$800 per net ton.

Group C.—Rates apply when valuation is over \$800 and does not exceed \$2,000 per net ton.

Group D.—Rates apply when valuation is above \$2,000 per net ton.

The lowest grade of Cobalt silver ore on which any of the smelters will bid must contain 60 ounces per ton, and this also approximately marks the low limit where ore can be shipped and still leave a slight profit above freight and treatment charges. With the introduction of milling nothing assaying that low has been shipped, because by jigging and hand picking, such material could be reduced possibly 50 per cent., yielding a high grade concentrate and leaving a product that could yield a further good profit by milling. This has been illustrated well in the last two years, for while the shipments in 1910 contained two cars of low grade to one high grade, this proportion was reversed in 1911. The decrease of the low grade shipments due to the introduction of milling does not have such a marked effect on the total shipments from the camp as might be expected, for this deficit is made up in part by the mills making the ore available for milling whose values lie below 60 ounces and above 12 ounces.

While it is true, and for the above reasons, that the shipments from Cobalt are on the decline as regards tonnage, the increase in value per ton has been such that the value of the total shipments shows a steady increase. From present indications the value of the total shipments from Cobalt for 1912 will show a material increase over 1911, which was up to that time the banner year.

A later development that is still further reducing the shipments from the district is a process introduced by the Nipissing Mining Company during 1911, for the treatment of high grade ores. This is a combination amalgamation and cyanide treatment, and the resultant product is silver bars 999 thousandths fine. This high grade mill has a daily capacity of five tons, so that the freight shipments will be reduced by this amount as the resultant silver is shipped out by express. A similar mill is now nearing completion for the Buffalo mine, which will mean the further reduction of freight shipments.

*The splitting point for values in the application of rates in the case of Denver is one dollar below that given above, and the minimum carload is 40,000 lbs.

THE FLOTATION PROCESS

As Applied to the Concentration of Copper Ore at the Kyloe Copper Mine, New South Wales

By J. W. Ashcroft.

The Kyloe Mine is situated near the township of Adaminaby, and is 32 miles from Cooma, the nearest railway station.

Geological and Mineralogical Features.—The orebody occurs as a lode in quartz felsite, which, at the lower levels, passes into aplitic granite. In the upper levels of the mine there is an occurrence of slate which also shows on the surface, but is not present in the deeper portions of the mine.

At the time when the present management took charge of the mine, the oxidized ore was practically exhausted. The ore, as now mined, consists of quartz with chalcopyrite and small amounts of bornite and iron pyrites. The composition of a typical sample of clean, rich, hand-picked ore is as follows:

	%
Cu	21.2
Fe	24.3
SiO_2	28.9
S	25.1
Bi	trace
Au and Ag	trace
	99.5

In places the orebody is found in the form of small veins in a crushed felspathic filling. A clay seam, or gouge varying from one inch to over a foot wide, occurs in the ore-channel throughout the workings. This clay, and that derived from the kaolinizing of the felspathic portion of the granite filling, was the cause of a good deal of trouble in the flotation treatment. A remedy was subsequently found in the addition of a large proportion of clean quartzose ore.

The Original Process of Treatment.—In the mill, as originally erected, the ore, after hand-sorting at the shaft bins (where waste was eliminated, and some clean copper ore picked out for shipment), was passed through a rock-breaker and broken to 1½ in. gauge and delivered on to a picking-belt, where as much as possible of the clean, rich ore was bagged for shipment.

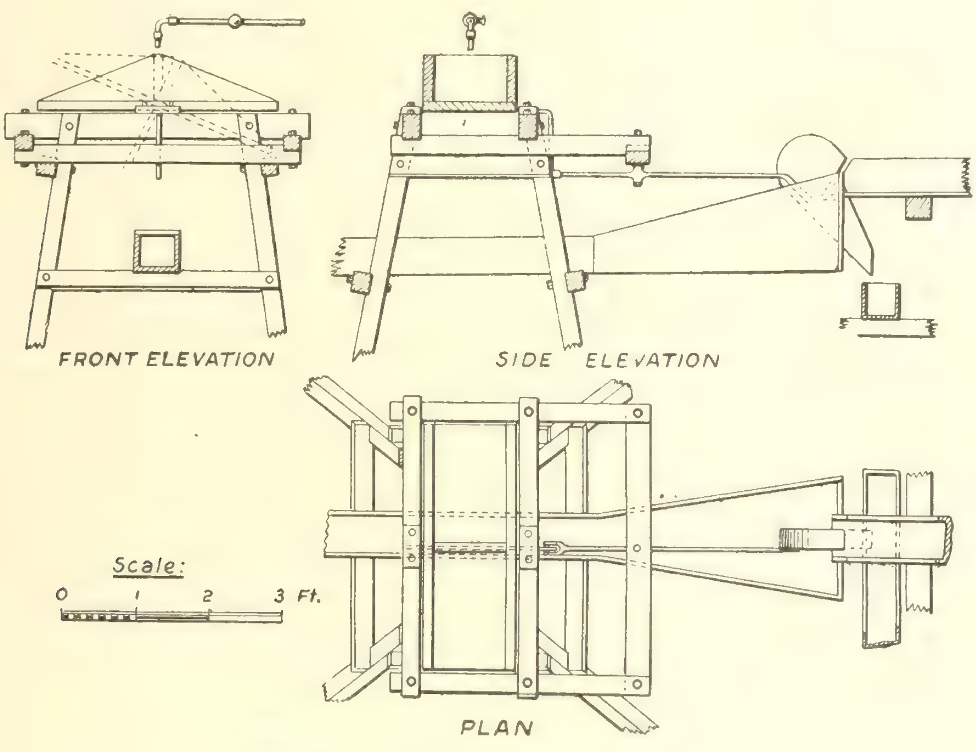


Fig. 1.—Flotation Tailings Sampler

The remainder then passed into the mill ore-bins assaying from 5% to 5½% of copper.

A typical analysis of the average ore treated is as follows:

	%
Iron	6.5
Copper	4.7
Sulphur	5.2
Lime	3.4
Insoluble	79.4
	99.2

From the mill-bin the ore was fed mechanically into an elevator, which discharged into a shaking screen. From this the oversize was fed, with water, into a set of Cornish rolls, and the undersize went to a May jig.

From the rolls the crushed ore fell into an elevator, and was once again fed into the shaking screen, together with the ore from the bins.

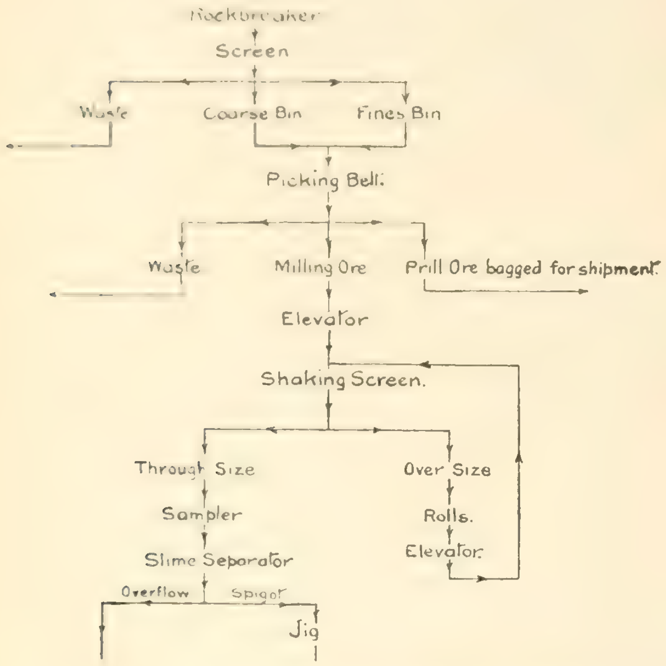
This arrangement is shown in the following flow-sheets, Nos. 1 and 2:—

An automatic sampler was placed in the launder leading to the jig, so that all material passing into the mill for treatment was correctly sampled.

Nº 1 Flow Sheet

From Rockbreaker to Jig

which is the same for all arrangements of the Mill.



While no originality is claimed for this sampler, a drawing of it is shown on Fig 1, as it is doing excellent work and may be of use in other plants.

The head product from the jig was dried, bagged and sold to a smelter, the tail ran to waste, and the middle products were reground wet in a ball mill, and, after classification, passed over Wilfley and card tables, the overflow from the classifier being thickened in a pulp-thickener, from which the spigot delivered on to a Frue vanner, and the overflow, which consisted of practically clear water, was run to waste.

An abundant supply of good soft water was obtained from the Eucumbene River, 1½ miles away. Subsequent experiments at other mines have shown that the characte rof the water has a noticeable effect on treatment by flotation.

This mill did good work over a period of 18 months, recovering 74% of the copper contained in the mill feed in the form of a concentrate carrying 19% to 20% of copper.

The concentrates were formerly smelted on the ground and the product shipped as a 50% copper matte, but owing to the high cost of firewood and fluxes, and an all-round increase in the rates paid for labour, it became more profitable to sell the concentrates to a smelter.

The cost of transport is extremely high, viz., £2 15s. 0d. per ton of concentrates from mine to the smelting works, and it is, therefore, essential to produce concentrates of as high a grade as possible. By lowering the grade of the concentrates, a higher extraction could have been obtained, but the extra cost of transport, and the lesser price paid by the smelter on the lower grade product, made it more profitable to ship one containing at least 20% of copper.

Experimental Flotation Treatment.—With a view of obtaining a better recovery and a higher grade concentrate, experiments were made with the Potter and the Minerals Separation process of flotation, and, the preliminary tests proving satisfactory, it was decided to erect a flotation plant; that of the Minerals Seperation was chosen, as it possessed advantages over the others as far as the treatment of Kyloe ore is concerned, in that it is more simple in operation on this particular ore.

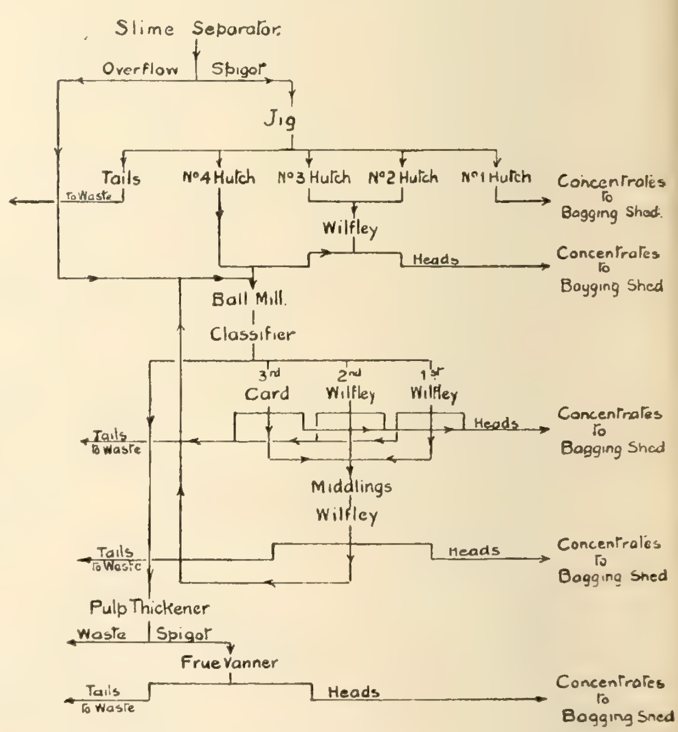
As the process was at that time untried on a working scale for copper ores, the old plant was left intact and a small annex added to the mill building to contain the flotation plant, and the lay-out so arranged that the whole of the work could be turned over alternatively to the original plant at any time; this proved to be a wise precaution, as radical alterations were necessary to the flotation process as first introduced before success was achieved.

Summary of the Different Processes of Treatment.—The flow-sheets accompanying this paper show the evolution of the present method from the original mill as already described.

Nº 2 Flow Sheet.

Shewing wet concentration lay-out

as adopted in the original Mill.



The flow-sheet, as far as the point of departure in treatment after the jig, has already been given on p. 4. and are common to all. Sheets Nos. 3 and 4 show:—

3. The first lay-out of the flotation plant;

4. The present arrangement of flotation plant as now in successful operation.

The Flotation Process as First Introduced.—This plant is divided into two sections, i.e., a grinding section and a flotation section.

The grinding was effected in two 8-ft. Forwood-Down pans; as originally erected these were made with a classifying discharge and were driven at 30 rev. per min.

The flotation machines is of the latest type used at Broken Hill on the zinc-lead seconds, with six stirring boxes, each 16 in. square, as shown in Fig 2.

The departure from the former method of concentration took place at the jig. The first hutch product was clean concentrate as before, the second and third hutch product was dressed on a No. 5 Wilfley also as before; the tailings from this Wilfley, together with the No. 4 hutch product and the jig tails, were sent to the grinding pans, and the overflow from classifier at the head of jig, together with the overflow from end of jig, passed through a pulp-thickener of the baffle-board type, the spigot from which discharged into the launder running to the flotation machine together with the discharge from the grinding pan. No. 3 flow-sheet on p. 7 shows the first lay-out of the flotation plant.

The pulp-thickener, which is an adaptation of a well-known type, calls for special attention, being of cheap and simple construction, and working admirably. The details of this apparatus are shown on Fig 3.

The flotation machine consists of a series of six square boxes fitted with revolving impellers, and each box connected to an outside chamber in which the separation of the mineral from the gangue takes place. From the bottom of the No. 1 flotation chamber the pulp is drawn by the action of the second impeller into No. 2 stirring box, and from No. 2 flotation chamber to the No. 3 box, and so on; the pulp from which the mineral has been separated being finally discharged from the bottom of the No. 6 flotation chamber.

The flow from the flotation chambers through the diagonal pipes into the stirring boxes is regulated by a valve on the top of each pipe, and the tailings discharged by a similar valve.

In this flotation process, as used by Kyloe, no acid is required, and the whole operation is conducted at ordinary temperature. The oil used is crude eucalyptus oil containing a large percentage of philandrene. This oil is manufactured in the district, and costs 8.5d. per lb., delivered at the mine. A great deal of information concerning the manufacture and properties of the various eucalyptus oils is found in a publication entitled "Eucalyptus and their Essential Oils," written by Messrs. Baker & Smith, and published by the authority of the State Government of New South Wales.

Defects in the Process as at First Applied.—A number of defects soon revealed themselves in both sections of the plant.

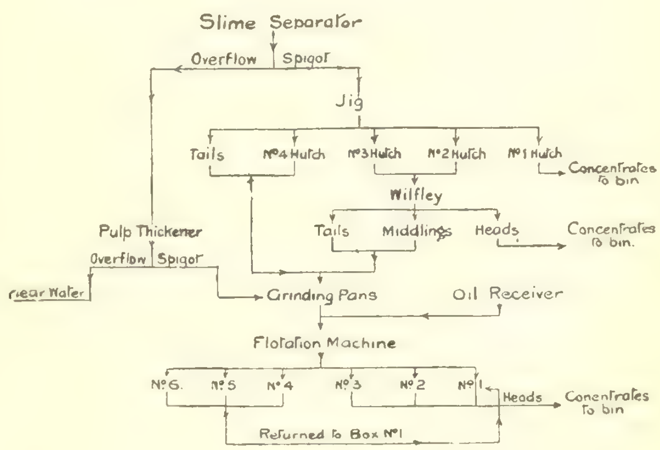
In the flotation machine the original slicing valves used were not sufficiently sensitive to regulate the flow properly, the correct adjustment of which through the different boxes has an important bearing on the successful working of the process, and the sliciny valves were therefore replaced by flap valves, operated by a rod with threaded end and hand wheel, which arrangement proved entirely satisfactory, and permitted very delicate adjustment.

As soon as work was started it was found that owing to the flotation chambers being all of the same width, while the amount of mineral to be floated became less in each one towards the tail end of the machine, the froth became very thin and poor after the first two boxes; to remedy this and give the froth a greater density and thickness, the flotation chambers were contracted on top by means of "crowding boards" which reduced their surface to widths varying from 11½ in. on No. 1 to 4½ in. on No. 5. No. 6 chamber was shortened by putting in a watertight bulkhead in addition to the crowding boards as in the other chambers; this narrowed the surface to 4 in. and shortened the distance through which the poor froth had to travel by one half, and gave less chance for the mineral to drop away from the froth into the tail before it was delivered into the discharge launder.

The machine now appeared to work fairly well, but the following samples, taken from the discharge lip of each of the flotation chambers, showed that the product from Nos. 4, 5 and 6 chambers were not sufficiently rich to be profitably shipped, so the concentrate launder was divided and arranged so that the products from Nos. 1, 2 and 3 chambers went to the concentrates bin, while those from Nos. 4, 5 and 6 were returned to No. 1 box in the machine and re-treated.

No 3 Flow Sheet

Shewing first lay-out of Flotation Plant



The samples referred to were as follows:—

	Copper.	Silica.
	%	%
No. 1 Overflow	27.2	21.2
" 2 "	24.1	41.5
" 3 "	22.3	59.6
" 4 "	15.6	61.0
" 5 "	14.3	60.7
" 6 "	9.4	68.7

After a short run it was found necessary to insert iron liners in the stirring boxes, as the wooden ones wore away very rapidly.

The opening into the boxes through which the pulp was drawn by the action of the impellers was also modified and made bell-mouthed, which improved the working considerably.

Inspection doors were also provided, so that the wear could be ascertained without dismantling the boxes.

As soon as the machine was again working normally, samples of the feed and tail were taken regularly, and the result of a week's run was as follows:

	Feed	Concentrates.	Tailings.	Recovery.
	%Cu	%Cu.	%Cu.	%
1st day.....	5.1	20.1	2.0	67.5
2nd "	4.4	24.2	2.3	52.7
3rd "	4.0	19.1	1.2	73.8
4th "	4.7	19.0	2.2	60.1
5th "	4.0	23.6	1.5	66.7
6th "	4.1	23.5	2.2	49.8

This although an improvement, was not yet satisfactory, so sizing tests of the various products were made to discover, if possible, in what direction to look for further improvement. The results were as follows:—

Mesh.	Feed.		Concentrates.		Tailings.	
	Wt.	%Cu.	Wt.	%Cu.	%Wt.	%Cu.
20	1.52	2.20	0.18	17.50	1.85	2.0
+40	13.17	1.20	0.30	17.00	17.53	1.2
+60	15.10	0.80	0.31	18.50	20.77	0.7
+80	3.55	1.15	0.52	24.70	6.10	0.6
100	22.50	1.40	7.42	53.60	21.40	0.6
+130	3.62	3.80	1.55	21.20	4.20	0.5
−130	40.40	5.45	89.60	23.75	28.00	1.2

These figures indicated that the material being fed into the flotation machine was not sufficiently uniform, and that it contained too large a quantity of comparatively coarse particles which could not be held up in the froth, and which in falling would carry down some of the finer particles that would otherwise have remained suspended. Improvement, therefore, lay in the direction of finer grinding and closer sizing.

Attention was now given to the crushing unit, and, as a preliminary, sizing tests were made of the infeed and discharge of the two grinding pans, which gave the following results:—

	No. 1 Pan.				No. 2 Pan.			
Mesh.	Feed.		Discharge.		Feed.		Discharge.	
	Wt	%Cu.	%Wt.	Cu.	%Wt.	%Cu.	Wt.	%Cu.
+16	16.4	2.3	—	—	10.0	1.4	—	—
+20	33.9	1.6	10.0	1.71	9.7	1.0	0.3	—
+40	13.0	1.3	17.1	1.2	10.5	1.2	11.0	1.4
+60	18.3	1.2	31.9	1.4	18.2	1.5	30.9	2.1
+130	6.9	2.1	16.9	3.2	17.0	3.0	23.4	4.1
+130	11.5	3.7	24.1	5.0	24.8	6.7	34.4	6.2

The No. 1 pan was taking the product of Nos. 2 and 3 hutch from the jig after being dressed on a Wilfley table. The discharge was 21 in. above the bottom of the pan.

The No. 2 pan was taking the overflow from the classifier at the head of the jig and a portion of the jig tail, the discharge was 22 in. above the bottom of the pan. The pans as arranged with the classifying feed would not take the whole of the jig tail.

As the foregoing sizing tests showed that an unduly large percentage of material, larger than 40-mesh, was contained in the ground pulp, the discharge of the pans was slightly raised and the product again sized, with the result that while the quantity of slime made was largely increased, the amount of product, larger than 40-mesh, was very little reduced.

The working of the machine was still unsatisfactory, the recoveries in the whole mill being only very little better than with the old system; but as all laboratory tests showed that a much better extraction was possible when the conditions were favourable, and as the trouble appeared to be chiefly mechanical, it was decided to rearrange the whole of the flotation plant so as to remedy the most apparent defects, which were:—

1st. The excessive amount of oversize in the feed to the stirring boxes.

2nd. The excessive dilution of the pulp.

3rd. The irregularity of the overflow from the flotation chambers due to the irregularity of the feed, and of the speed of the impellers.

4th. The want of proper means to control the supply of oil.

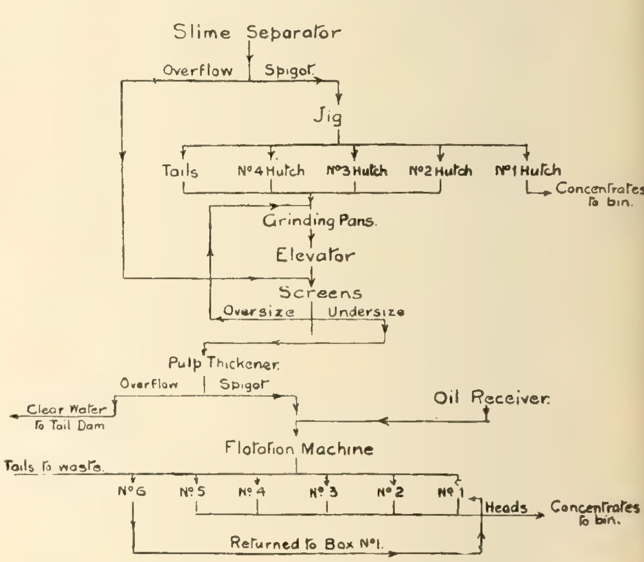
Rearrangement of Plant.—In order to remedy the defects mentioned the mill was turned over to the old system while the following alterations were made in the flotation plant, i.e.:—

1st. The grinding pans were altered from the classifying discharge, to the positive feed type, and were arranged to discharge on to revolving screens so as to keep the feed to the flotation machine more even in size.

2nd. The pulp thickener was moved and placed between the screens and the flotation machine so as to keep an even feed to the stirring boxes and to regulate its density.

N°4 Flow Sheet.

Shewing present arrangement of Flotation Plant as now in successful operation



3rd. The flotation machine was connected to a separate engine with a sensitive governor so as to keep the speed of the stirrers constant.

4th. An apparatus was made for adding the oil to the pulp in such a manner as to ensure an even flow.

The revolving screens are of a type used in Broken Hill and are shown in Fig. 4; they do excellent work and are economical to run.

The screening cloth used is Greening's L.W.C. 600-mesh with aperture 0.0268 in.; size A.K.D. 900-mesh with aperture 0.0217 in. was also used at first, but the L.W.C. was found to last longer and to give equally good results and so was finally adopted. The screens last about ten weeks for each covering.

The method of adding the oil to the pulp, which was finally adopted, consists in placing two drums, one above the other; in working, the top drum is filled with oil from this to the lower one is regulated by a floating ball valve, thus ensuring a constant head in the lower drum. From the lower drum the oil drops at a constant rate into the launder which carries the

pulp from the screens to the flotation machine, at the rate of about one drop per second, amounting to 0.65 lb. of oil per ton of dry ore treated.

In the rearrangement of the plant no concentrating tables were used at all, but the whole of the products from the jig, excepting that from the No. 1 hutch (which was bagged for shipment) were sent direct to the flotation plant in order to give a larger percentage of mineral there, and so form a thicker froth in the flotation chambers.

Flow-sheet No. 4, given on p. 8, shows the rearrangement, and it will be seen from it that the only actual additions to the plant as originally designed are the screens and elevator, but that there is a considerable difference in the general lay out.

Having remedied the defects in the grinding plant the flotation machine began to do much better work, the result of a six days' run being as follows:—

	%Cu.	%Cu.	%Cu.	%
1st day.....	3.9	23.8	1.1	75.2
2nd "	4.0	21.4	0.9	80.4
3rd "	4.7	25.4	1.0	82.0
4th "	4.8	25.8	1.4	74.8
5th "	5.3	26.1	1.4	78.0
6th "	4.1	25.6	1.5	67.3

It was soon found that a certain type of feed gave bad results, i.e., where there was a large percentage of oxidized and kaolinized lode matter, and the high tail values in the last three days' work given above were due to this cause.

On one occasion when there was sufficient of this deleterious material to discolour the pulp to a dirty yellow, practically no flotation took place, the pulp leaving the boxes at approximately the same value as it was fed in. There was no true froth, only large, shiny bubbles, and a little coagulated sulphide which overflowed the flotation chambers; samples taken from each chamber at this time gave the following results:—

Feed %Cu.	No. 1 Chamber %Cu.	No. 2 Chamber %Cu.	No. 3 Chamber %Cu.	No. 4 Chamber %Cu.	No. 5 Chamber %Cu.	No. 7 Chamber %Cu.	Tails
3.5	9.3	8.2	6.3	7.3	6.5	8.8	3.0

The film forming these large bubbles was very tenacious, and no improvement took place while the feed was discoloured in this way.

Tests made indicated that the deleterious effect was due to the physical rather than the chemical properties of the material and to the peculiar nature and excessive quantity of the slime produced by it; in order

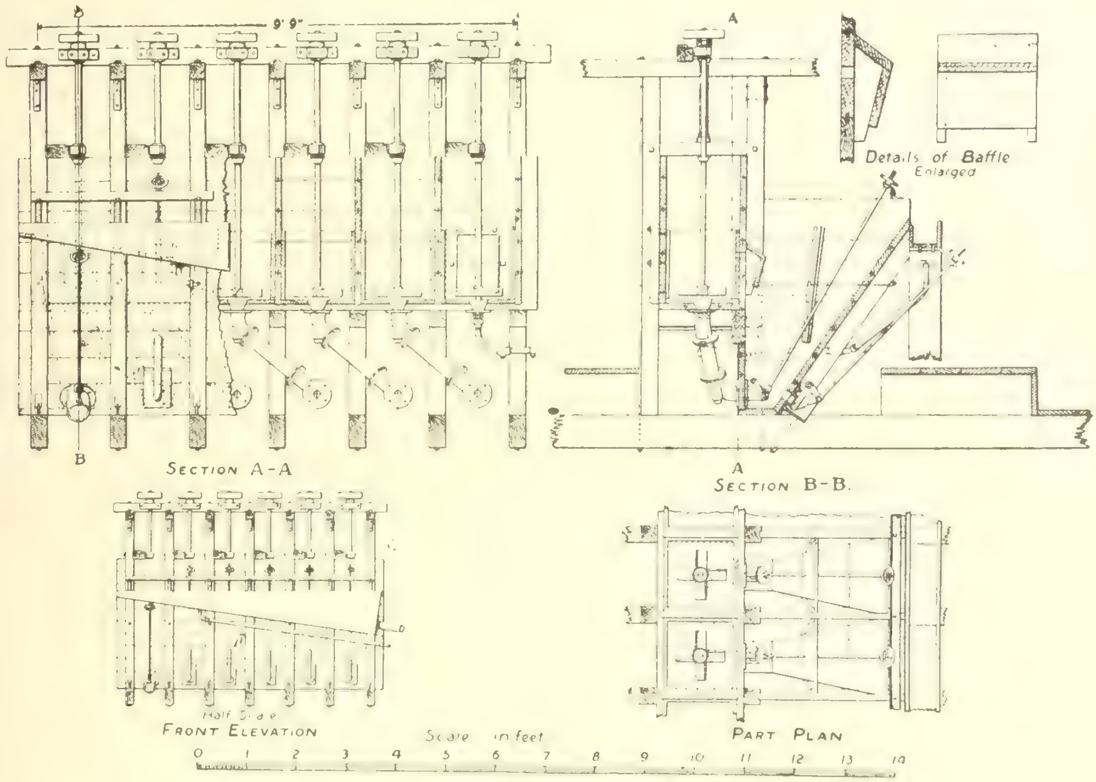


FIG. 2.—General arrangement of Flotation Machine.

to determine definitely what effect the large quantity of slime had upon the working of the process, daily sizing tests were made of the infeed to the flotation machine extending over a considerable period, and these showed that when this contained more than 40% which would pass through 130-mesh, the quality of the work began to fall off, while the best results were obtained with from 20% to 30% of this size in the feed.

Since the trouble arising from the "dirty" ore, the mill feed has been regulated so as to contain only a small percentage of this in the total feed, and the result has been uniformly good, only very occasionally the

The extraction percentage above is worked out on the following formula, viz.:—

$$\frac{\dfrac{A - B}{C - B} \times 100\ C}{A} = \%\ \text{extraction.}$$

Where A = percentage of value in feed
B = " " " tail
C = " " " concentrate

which is convenient for approximate estimations when it is impracticable to weigh the products.

separation becomes poorer and this can now be very quickly corrected by the man in charge, who can tell by the appearance of the froth; once running in proper order, the machine is easy to regulate, and will sometimes run for 48 hours without being touched, but at others, if the character of the feed changes, it will require frequent adjustment until the feed is again regular in composition.

The results of a week's run of the flotation plant when it was in good working order were as follows:—

	Feed.	Concentrates.	Tailings.	Extract'n.
	% Cu.	% Cu.	% Cu.	%
1st day....	3.8	25.1	0.95	77.9
2nd "	3.0	23.3	0.85	74.3
3rd "	3.0	24.2	0.65	81.0
4th "	3.15	23.7	0.55	84.5
5th "	4.1	25.6	1.05	77.5
6th "	4.4	24.6	0.90	82.5

These figures show a recovery better than is obtainable by any other known concentrating process on this class of ore, and when it is remembered that, in the case of the Kyloe ore, the mineral contained is nearly pure chalcopyrite, the tailing values are very low.

The plant has now been in successful work for over six months, the mill recoveries from July 29th, 1911, to January 27th, 1912, inclusive, being as follows:

Ore Treated			Concentrates made			
Tons.	Copper Contents Tons	Assay Value	Tons	Copper Contents Tons	Assay Value	Extraction
7855	411.97	5,24%	1562	355.79	22.65%	83.36%

The recoveries are those for the whole of the concentration plant, and are worked out from the weights and values of concentrates made and shipped as against the daily assay of the mill feed. The actual recovery in the flotation plant apart from the jig is approximately 80% on a 3.5% feed and the assay value of the flotation concentrate is over 25% copper. It is as well to state here, that it has been proved by experiment that the extraction could be increased up to 92% or over, by lowering the grade of the concentrates, but, as already explained, owing to the high transport charges, there is more profit in making the higher grade product even though doing so involves making a smaller recovery.

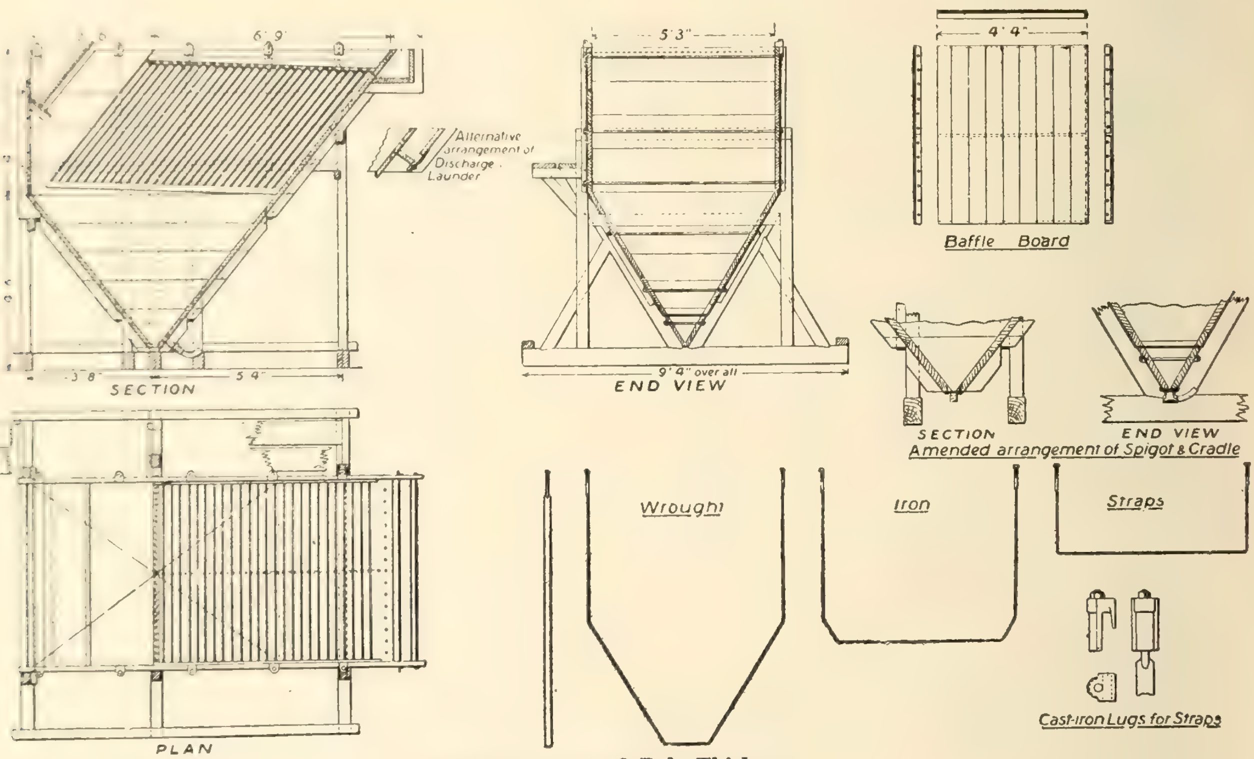


FIG. 3.—Improved Pulp Thickener.

Drying the Concentrates.—The concentrates made are in a very fine state of sub-division and very frothy; filtration was tried as a means of getting rid of the water, but proved a failure without the aid of presses or vacuum plant. It was found, however, that by runing the material into a tank and spraying the surface, the froth was broken up; the introduction of a baffle board at the overflow end of the tank caused the mineral to settle and allowed an overflow of clear water. There are two of these tanks in use, and the concentrates are settled in each one alternately, the water is run off as closely as possible, and the wet concentrates then shovelled out on to a drying floor, heated from underneath, and from there, when sufficiently dry, into bins ready for bagging.

In order to demonstrate this clearly, the following figures are given for 100 tons of ore:

The costs of transport are as follows, i.e.:

Cartage to railway station	£1	12	6	per ton.
Trainage to smelting works	0	13	10	"
Agency and sundry charges	0	1	6	"
Bags and bagging concentrates	0	7	2	"
Total per ton of concentrate	£2	15	0	"

The feed in both cases is taken at 5.24% copper.

1st case—

Making an 86% recovery with a 22.6% concentrate as at present

86% of 5.24=4.5064 tons copper,

and 4.5064 tons copper=19.94 tons of 22.6% concentrates.

Copper is taken at £60 per ton.

Returning charge on 22.6% material is 2s. 7d. per unit, with 1.3% deducted from assay value.

Then 22.6—1.3=21.3×19.94=423.33 units copper.
423.33×(12s.—2s. 7d.)=9s. 5d........£199 6 4

Deduct—
19.94 +3% moisture=20.54 at £2 15s.. 56 9 8

Nett return £142 16 8

2nd case—

Making a 92% recovery with a 19% copper concentrate:

92% of 5.24=4.8208 tons copper,
and 4.8208 tons copper=25.37 tons of 19% concentrates.
Returning charge for this grade is 2s. 9d. per unit.

Then
19—1.3=17.7×25.37=449.05 units copper.
and 449.05× (12s.—2s. 9d.=9s. 3d.)= £207 13 8

Deduct—
25.37+3% moisture=26.13 tons at £2 15s 71 17 2

£135 16 6

Ore miller, 8556 tons. Residues treated, 5732 tons.

Costs.	Per ton of Ore Milled. s.	d.	Per ton of Residues Treated. s.	d.
Re-grinding, screen and flotation	1	3.6	1	11.2
Power	0	2.3	0	3.4
Drying and handling concentrates	0	3.8	0	5.7
Maintenance and renewals	0	6.6	0	9.8
Assaying, lighting, etc.	0	2.3	0	3.4
Water supply	0	3.4	0	5.1
Superintendence and proportion of management and office expenses	0	2.1	0	3.3
	3	0.1	4	5.9
Royalty	0	6	0	9
Total cost	3	6.1	5	2.9

The royalty paid is saved by the Kyloe Company in the lesser returning charge from the smelters due to the higher grade of concentrate made.

During the first three months of this period a portion of the jib residues were run to waste, as owing to the want of power the pans could not take the whole of them; this has since been remedied and the cost per ton

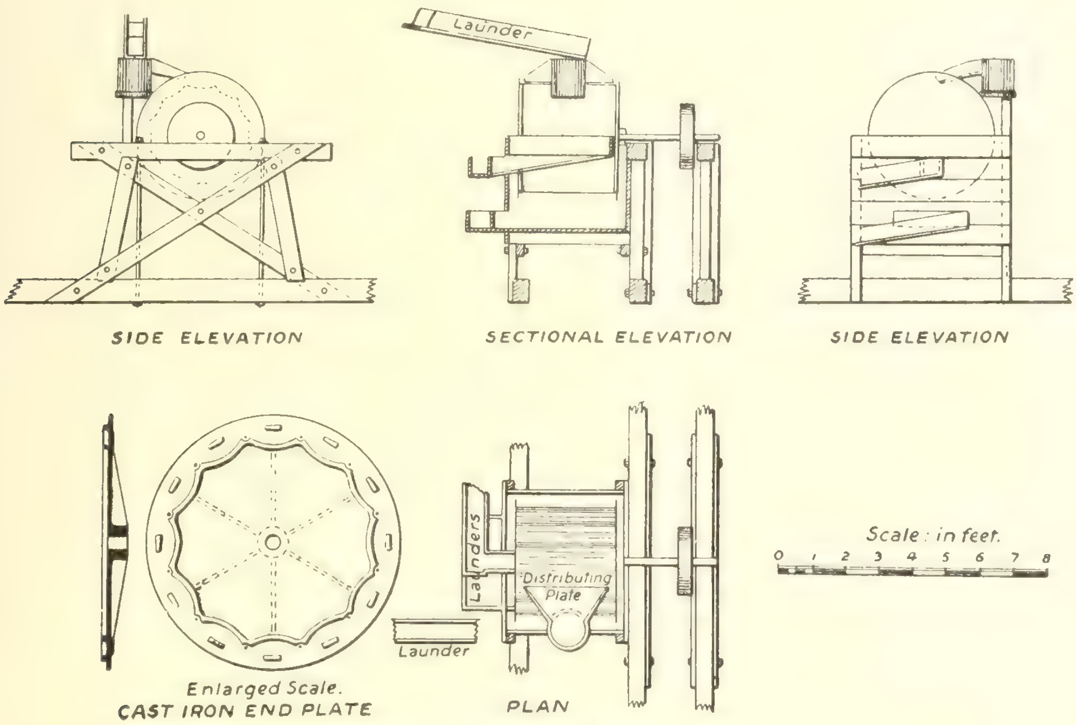


Fig. 4.—Revolving Screens.

or a difference in favour of the lower recovery and higher grade concentrate of £7 0s. 2d., equal to 1s 5d. per ton of crude ore of 5.24% original value in copper.

It is thus clear that under the conditions existing at Kyloe it is essential to keep the concentrates to as high a grade as possible, even at the cost of sacrifice in the recoveries.

Cost of Running Flotation Section.—The actual cost for the 24 weeks from July 3rd to December 16th, 1911, were as follows:

of residues treated is now only about 10% over the cost per ton of total ore milled.

These costs include the re-lining of the stirring boxes with iron liners in place of the wooden ones originally put in, and also some alterations to the pans, which makes the item "Maintenance and renewals" appear high.

The cost of oil, which is included under (1) is 5.2d. per ton of residues treated, or 3.5d. per ton of ore milled.

The total cost of milling for the period, including crushing, belt picking, fine crushing, jigging, re-grinding tails and flotation, together with all maintenance costs and proportion of management and office was 7s. 8.7d. per ton, and the cost of delivering the ore from the mine to the mill bins was 3.3d. per ton.

The mine being a small one, the tonnage available for treatment is also small, i.e., 60 tons per day, and costs are therefore higher than they would be on a large tonnage, but owing to there being no acid required, no heating of solutions, and to the more favourable conditions existing at Kyloe, the flotation costs are considerably lower than they are at Broken Hill, where the process is worked on the zinc-lead tailings.

Cost of Plant.—This will necessarily vary with local conditions, but owing to the very small space occupied and the simplicity of the apparatus employed, it will probably cost 25% less to instal than a corresponding wet dressing mill with tables, slime plant, etc.

Conditions for Successful Working.—So far, present experience indicates that any clean sulphide of the metals can be treated if the physical conditions are right; these are:

(1) That the particles must be clean and free from oxidation.

(2) That the gangue must not be of so clayey a nature as to form a fine slime which coats the surface of the sulphide particles and prevents their attaching themselves to the bubbles formed, or which in itself forms too large a proportion of "gangue slime" which comes up with the froth and destroys its holding power for the sulphide.

(3) The material to be treated requires to be ground as evenly as possible; the best size has to be determined on each individual ore.

(4) The feed and speed of the stirrers must be correctly proportioned and kept as even as possible.

(5) The thickness of pulp fed into the machine must be regulated and kept as even as possible.

(6) The minimum amount of mineral required to be present in the ore has not yet been determined; at Kyloe it amounts to approximately 10% of the weight of the ore, and this gives excellent results. Experiments are now being made to determine if possible the minimum amount allowable; any excess can, of course, generally be removed by jigging or some other form of concentration before flotation.

In some cases the addition of clean pyrites may be beneficial, but as the successful float depends largely upon the total quantity of minerals, rather than the percentage in the ore, it is in many cases possible, by keeping it back in the flotation chambers, to treat successfully very low-grade material. This must, however, be tested on each ore separately.

(7) The water used has a marked effect on the process, and necessitates modification according to its hardness and chemical constituents, but a bad water is not necessarily detrimental to the working of the process.

The machines as now used are a great improvement on the old type of pointed boxes, and will no doubt be further improved upon as experience suggests modifications.

The grinding of the ore to prepare it for flotation may be done in nearly any form of machine, provided that it does not make to much slime, although the process can work successfully with a considerable quantity. The best type of machine is one which screens off the material as soon as it is crushed and returns the oversize back again. The ideal to be aimed at is to keep the particles as nearly of a size as is practicable.

In the foregoing pages the poor success at the first starting of the plant has been dealt with rather fully, for the reason that the experience gained therefrom may be of use to others when starting on a new plant, and the following up of the various causes of trouble may assist in locating weaknesses in other installations.

In conclusion, the writer would state that the Kyloe Company are very largely indebted to Messrs. Faul and Lavers, the engineer and chemist respectively of the Minerals Separation Company, for the ultimate success of their plant.

TECHNICAL LITERATURE

Natural Gas in Western Canada.—Mr. Aubrey Fullerton contributes to the Mining and Engineering World an interesting account of the natural gas belt of Alberta, extending north and south, in the neighbourhood of the 112th meridian. The latest strike in this field was made in June last, at Tofield, gas being here encountered at a depth of 1,054 feet. The quality of the gas is said to be excellent for both heating and lighting purposes. At other towns in the surrounding district arrangements are being made for boring. Gas from the Bow Island wells has been piped a distance of 180 miles to Calgary, where it is sold at rates varying from 15 cents per thousand for power, to 35 cents for domestic uses. In the northern section of the belt, at Pelican rapids, a point on the Athabasca river, 200 miles north of Edmonton, is a gas well that has been burning for 14 years, and the flow shows no indication of lessening. This well was sunk by the Geological Survey in 1898. Gas was struck at a depth of 820 feet, and the flow was so great that it drove back the drill, and the noise of the escaping gas could be heard at a distance of two or three miles. The Survey recommended that a new bore at the depth of 820 feet, where the gas was first encountered, "should be at least 10 in. in diameter; then it would be possible to reduce the casing four or five times, giving that many lines of pipe in getting by these gas veins." Meanwhile the search for oil was necessarily abandoned, and until the railway render the region accessible there is little likelihood of further search. The big gas jet is still blazing wastefully, and a great coal area further north is also on fire.

The Gold Placers of Woodchopper Creek, Alaska.—The United States Geological Survey has recently issued a bulletin, in which these deposits are described. Auriferous gravels are distributed over a considerable area along Woodchopper creek, on the Upper Yukon; but no rich or extensive deposits have been found. The relative accessibility of the placers to the Yukon is favourable to cheap mining, but only a small volume of water is available for sluicing. Operations to the present have been of a primitive description, with one exception.

Copper as an Alloy of Steel.—In a letter to the Mining and Scientific Press, Mr. Kirby Thomas, in discussing the effect of copper on steel, quotes from a report

on the subject made by Mr. C. F. Burgess, who in collaboration with Mr. James Ashton, conducted a series of experiments in the use of copper as an alloy of iron, under the auspices of the Carnegie Institute of Washington. This report stated: "Our results and comparisons would indicate that the copper-iron alloys are also worthy of consideration and might be comparable to the nickel steels in use, even if the strength should not reach such high values as those of the nickel. A 1½ per cent. copper alloy is of promise, since the smaller percentage required and the lessened cost per pound of copper as compared with nickel would result in a lessened cost of construction, even if there is some increase in tonnage required because of the slightly decreased strength per equal weight." Other investigators, Mr. Thomas remarks, have made interesting tests of alloys of copper and steel. Notably Pierre Breuil, who in 1907 endeavoured to ascertain if beneficial results would follow the addition of copper to steel, as suggested by the favourable influence of copper on steels for railway axles, which was noted as being the case on some of the French railways. Breuil mentions that a 4 per cent. copper alloy with mild steel as being worthy of further study, and generally confirms the claim that certain copper-steel alloys are of commercial advantage. It is meanwhile reported that the New York, New Haven & Hartford Railway has found that Scotch rails, containing 1½ per cent. copper are in point of durability greatly superior to ordinary steel rails. If this becomes universally recognized, it will undoubtedly have an important bearing on the copper industry.

The Effect of Alumina in Blast-Furnace Slags.—We referred in a recent issue to some statements made by Mr. Bellinger in the course of his presidential address to the Australasian Institute of Mining Engineers, bearing on this subject. It is again discussed in a paper contributed by Mr. J. E. Johnson to the Cleveland meeting of the American Institute of Mining Engineers. Mr. Johnson, after stating that in the discussion on the effect of alumina, some have regarded it as an acid, others as a base, while a few have declared that it can be made to act as a base or acid almost at will, gives as his own view that under such circumstances it is probable that its action was neither acid nor basic, but perfectly neutral, being simply a dilluent affecting the viscosity of the slag to some extent, but, with a given ratio of lime to silica, not affecting its chemical nature at all. He advances much data in support of this contention.

Milling Practice on the Rand.—In the discussion following the presentation of a paper by Mr. P. Nissen and read before the Chemical, Metallurgical and Mining Society of South Africa, on the subject of the high duty gravity stamp mill, the prediction was made that in the near future nearly all ½-inch product on the Rand will be sent direct to the tube mills, without even passing through the crushers. Already at one mine ¼-inch material is being pumped direct to the tube mills.

Gob Fires and Their Prevention.—In an address before the Manchester Geological and Mining Society, Dr. John Harger, in dealing with the subject of gob fires, classified them under three heads, namely. (1) Those which occur in unworked coal; (2) those which originate in the coal and shale left in the goaf—left there because it is dangerous to the man to take it out or because for some reason it does not pay to take it out; (3) those which originate on a fault side where some coal is often left, and where the coal is often found in fine condition, caused by the grind to which it has been subjected. The second class of heating is generally supposed to be due to a short circuiting of air through such waste from the intake to the return road. The fires of this class all have one feature in common. Thus the roof has been held up and so has not crushed the waste close enough to prevent the short circuiting. In many cases it has been observed that the first signs of a bog fire are not noticed in the return, but in the intake side of the waste. In these cases the first signs, smell or smoke, are observed after a big decrease in atmospheric pressure. Such places may be likened to a bottle having only one opening for the air. In most gob fires of any size belonging to class 2 and 3 some props are found to have been left in. Timber thus left will certainly tend to hold up an open space for some time, and if the coal heats the timber, no doubt it will ignite before the coal; but in all probability such timber is not the primary cause of heating. It does, however, have the effect of hastening heating, and renders moreover the treatment of such heatings more difficult by reason of the pungent fumes given off, and it is more likely to blaze when exposed to the air than is coal at the same temperature. It is, therefore, of great importance in a mine subject to gob fires that no timber should be left in the waste. With regard to the prevention of gob-fires, the reversal of the air current from time to time was recommended as a simple means of removing the danger of dust explosions. It was further advised that a constant supply of inert gas be conveyed into the suspected wastes, where heatings were most likely to occur, and so prevent them forming. The quantity of such gas required was comparatively small—just sufficient to counteract the changes in the atmospheric pressure, all openings being stopped so far as possible, would undoubtedly arrest heating. The inert gas is readily obtainable by the combustion of suitable fuel, but care must be taken that it contain no carbon monoxide. The exhaust gas from an ordinary gas engine, with its exhaust apparatus suitably modified, would give excellent results if the air supply was controlled and complete combustion attained by passing the hot gases over a catalytic material. One way of treating gob fires with absolute safety is to at once reduce the oxygen ventilation in the district in which a fire is discovered. With 17 per cent. oxygen no fire can make much headway.

Persistence of Ore in Depth.—In a recent issue of the Mining and Scientific Press, Mr. Malcolm MacLaren criticizes some generalizations on this subject that he attributes to Mr. T. A. Rickard, who, he states, concludes that after the oxidized zone and the zone of secondary sulphide enrichment are passed, ore deposits must be expected to become leaner with increasing depth. This he considers to be pernicious doctrine if universally applied; "the more so, in that for most ore bodies it contains a kernel of truth. Thus it is entirely true when its application is limited to a certain group of ore-bodies, namely to those formed near the existing surface, including not only deposits formed in recent geological times, but also some of Paleozoic and pre-Cambrian age. In the latter cases subsidence and burial beneath later deposits have protected the upper portions of these ore channels against the effect of erosion; and the auriferous conglomerate of the Witwatersrand is quoted as an example. Mr. MacLaren remarks that all deposits of this group originated from the cooling of rising solutions on approach to the

earth's surface, but, he states, many deposits, occurring chiefly in Archean and Paleozoic rocks, and occasionally in Mesozoic strata, cannot be ascribed to simple cooling. Lode fissures in these rocks are normally very steep, while the strata are usually much disturbed. It is a fundamental axiom that in these older deposits the nature of the lode-wall exercises a vital influence on the richness and sometimes on the mineral character of the orebody. Hence it rarely happens that a great depth is reached before the lode, worked from the outcrop downward, has passed out of the favorable rock. "Herein lies the kernel of truth in Mr. Rickard's generalization, but surely the fact should be stated in terms of geologic structure and not of depth." Future industry, Mr. Maclaren considers, must more and more concern itself with concealed orebodies, and it is here that a universal acceptance of Mr. Rickard's proposition would prove harmful both to the engineering profession and to mining capital.

Gasoline Locomotives for Mines.—Gasoline locomotives for mine haulage have already been introduced in Canada, and two or three are now in use in the Frank district. A description of one of the latest types is known as the "Otto," is given in Mining Engineering. The locomotive consists essentially of the underframe, the engine, and the driving gear. The underframe resting directly upon springs carries both the engine and the driving gear. The engine, of the horizontal type, works on the four-stroke cycle. A mixture of air and oil in an atomized state is sucked into the cylinder by the first forward piston stroke, which is compressed by the return stroke, at the termination of which the ignition occurs. The actual work done is accomplished by the combustible gases during the second forward stroke of the piston, the so-called "power stroke," after which the exhaust gases are driven off the cylinder by the second return stroke of the piston. The cylinder itself is made of specially hard cast iron and is so fixed into the water jackets that it is free to expand and contract by the uneven heat, and can be readily removed for renewal. The valves are mechanically actuated by the cams, rollers and levers from the cam shaft, the latter running at half the speed of the crank shaft and driven in the usual manner by means of worm gearing. The speed of the engine is regulated by admitting a larger or smaller explosive mixture into the cylinder to suit the varying loads upon the engine. The quantity of fuel and air admitted is controlled by the governor, which continually adjusts the length and duration of the stroke of the admission valve by shifting the position of a tapered cam sleeve. By this method of governing, the explosive mixture, proportioned to ensure uninterrupted firing and favourable to an economical operation, always remains in the same proportion for all loads. The air inlet is designed with a view to make back firing of any flame impossible. The exhaust gases are cooled and cleaned, being made to pass a condenser provided with baffle plates, and thence, accompanied by a stream of water, into the silencer, where a gravel filter and several inserted wire-gauze strainers complete the purification. The exhaust gases are thus discharged in a cooled state and practically free of smell. The ignition of the charge takes place inside the cylinder by suddenly breaking the electric current. The locomotives are mainly designed for one speed only, namely from 4 to 4½ miles an hour. The fuel consumption per h.p. per hour is stated to be 0.66 lbs. of gasoline. At Frank, the working costs per ton per mile are estimated at from 2 to 2½ cents.

The Russian Platinum Deposits.—Writing in the Mining Journal (London), on the platinum occurrences of the Urals, Mr. E. de Hautpick points out that recent geological investigations have confirmed the fact that the platinum in the placers is derived from olivine rocks, the outcrops of which conform—for example in the Urals—to the known narrow zone where the deep-seated rock was exposed. Thus, the only hope of new discoveries of the mineral is in the districts of the Northern Urals, where there are considerable exposures of olivine. The present known richer placers are, meanwhile, being exhausted rapidly, but the high prices now obtaining have stimulated the exploration of poorer territory.

Graphite Mining in Ceylon.—In the course of an article contributed to the last issue of "Economic Geology," descriptive of the graphite deposits of Ceylon, the author, Mr. Edson S. Bastin, gives an interesting account of the mining and dressing methods in vogue in that country. The graphite is mined either from open pits or through vertical shafts connecting with underground workings; but the majority of the mines are not deeper than 100 feet. In a few of the mines steam pumps and hoists are employed, although as a rule the mining methods are still very crude, "the acme of mechanical ingenuity being reached in a windlass operated by five or six men for hoisting the graphite in a sort of tub." The mineral as it comes from the pits may contain as much as 50 per cent. of impurities, mostly in the form of quartz and wall rock. It is conveyed in bags to a dressing shed where it is picked over and the impurities reduced to 5 or 10 per cent. It is then packed in barrels for transportation to Colombo or Galle. Here it is submitted to further treatment known as "curing." The graphite merchants have fenced yards in which graphite is finally prepared for the market. In the methods of "curing" there is some diversity, but the first is usually to set aside the large lumps and to pass the remainder through stationary screens of different size mesh. The large lumps and screened ore are then broken by women, who remove the coarser impurities, and they are then rubbed and polished. The poorer material is usually beaten to a powder with wooden mauls or clubs, and then sorted into different grades. In some establishments the more impure grades are washed in a tub or pit. In this process the mineral is placed in saucer-like baskets and by a circular "panning" motion, while immersed in the water, the graphite particles are thrown off into the pit, while the heavier impurities remain. To separate the very fine material the powdered graphite is placed in a basket, the contents being thrown into the air. The heavier particles thus fall back into the basket, while the finer material is blown forward and settles on the floor.

Coal Dust and Explosions.—The second report, just made public, of the Home Office Committee on Explosions in Mines, states that when considering the relative degrees of inflammabiliy of coal dust it can be accepted as an axiom that the finer the dust from any particular coal the greater its inflammability. The true chemical nature of coal is not yet properly understood. Some insight, however, has been acquired into the general character of the compounds that form the "coal substance," and a relationship has been traced between the proportions in which these different compounds exist in any particular sample of coal and the inflammability of its dust. The methods that have been applied as a general rule to elucidate the question

of the chemical composition of coal have been either (1) to treat the coal with different solvents or agents in the hope of being able to extract some simple substance therefrom, or to form some definite chemical combination therewith, or (2) to distil the coal destructively, and to examine the products of decomposition. The first-named method has shown that certain resinous bodies, soluble in such liquids as chloroform and benzine, are contained in certain coals in small quantities, but their identity has no been definitely established, and they do not form an important part of the coal substance. A discovery by Bedson hat pyridine dissolves a considerable proportion of many bituminous coals promises, however, to yield more valuable results. A method is described by which the relative inflammability of different dusts can be ascertained by measuring the temperature of a platinum coil, which just ignites a uniform cloud of dust and air projected across the coil fixed in a glass tube. It is shown that the relative inflammability does not depend upon the "total volatile matter," but on the relative ease with which inflammable gases are evolved. The order of inflammability so obtained corresponds in a remarkable degree with the percentage of inflammable matter extracted from the same coals by pyridine. The committee are of the opinion that these two methods form a valuable means of discriminating between different coals in regard to the sensitiveness of their dusts to ignition. It must, however, be borne in mind that these tests have been made with dusts artificially ground and sieved to an equal degree of fineness, and, since coals differ considerably in their power of resistance to pulverization, the friability of the coal must be taken into account. No doubt, also, the porosity of a coal and the shape of its dust particles may affect its inflammability.

MOOSE MOUNTAIN IRON MINE

By F. A. Jordon, Selwood, Ont.

The Moose Mountain Iron Range has been traced by prospectors in a northwesterly direction, from the northwest shore of Lake Wahnapitae, in the district of Nipissing, to Lake Onaping, in the district of Algoma, a distance of approximately 35 miles.

A description of the property of Moose Mountain, Limited, will in a general way describe the ores and deposits of the range. The property is located in Hutton township, in the district of Nipissing, and its development has caused the building up of the town Selwood, which is its centre and its post office, and which was named after Captain Joseph Sellwood, whose name is prominently identified with the development of the Lake Superior iron region, and who is the real father of the Moose Mountain range, being one of the owners of Moose Mountain, Limited. Sellwood is located on the C.N.O. Ry. 289 miles north of Toronto. Sudbury is its nearest important centre, which is 25 miles to the south. Relative to the Range, Sellwood is at about its centre, and here the range limits the finding of all the deposits in a width of northeast to southwest of about four miles.

Iron ore had been known to exist in Hutton township for many years. During the gold excitement of the early nineties, prospectors travelling the west branch of the Vermilion river, in search of the precious metal, portaged across a ridge, at a point known as Iron Dam, and what is now called a part of No. 2 deposit.

The wearing away of the moss had exposed the ore in several places, but at this point the ore is low in iron, probably not over 30 per cent., and this is quite likely the reason that it attracted only passing notice. It was not until 1901 that some prospectors, who in a couple of years previous had done some exploratory work in a radious of two miles around Iron Dam, interested the Moose Mountain, Limited, to undertake the development and mining of iron ore on the range. At this time, there was no railroad into the district, but Mackenzie, Mann & Co. were then contemplating their Toronto to Port Arthur line, and, after some negotiations, arrangements were completed with them to give the range transportation facilities. This took some time, and it was not until the spring of 1906 that any work was done towards developing the mine. In this year the work consisted in test pitting, trenching, cross-cutting in rock and magnetic reconnaissance. The deposits which had been outlined in 1902 by Mr. Kenneth Leith with the compass, were test pitted, trenched and further extended by magnetic reconnaissance, and one not previously known was found, making in all, eleven deposits, numbered for convenience from 1 to 11 inclusive. At that time data were collected of the different deposits, which, with the diamond drill done in the following year, makes it appear that the tonnages are as follows:

	Tons.
Deposit No. 1	2,000,000
2	60,000,000
3	3,000,000
4	2,000,000
5	2,000,000
6	....
7	1,000,000
8	....
9	....
10	....
11	40,000,000
	110,000,000

No estimate has been made of deposits 6, 8, 9 and 10 since very little work has been done on them and their exposures are small. In September, of this year, 1906, work was commenced on a crushing plant at No. 1 deposit. This deposit rises as a hill, from a depression through which the railroad reaches it, to a height of 140 feet. At a point 65 feet about the track, a rock cut was driven to the ore and below this was chosen as the location for the crushing plant which will be described later. It is well here to describe the ore of this and other deposits on the property, and to classify them into two groups, purely from the operating standpoint. It will still remain for the geologists to classify their different geological relations.

All of the deposits are inclosed on all sides, by rocks of the Keewatin series, collectively as greenstones, except isolated and small intrusions of Laurentian gran-

ties. There has been very little disintegration of these enclosing rocks and the iron ore deposits do not stand out as mountains of iron, as might be popularly supposed, from the name Moose Mountain, given by the early prospectors to the No. 1 deposit. The ore is exposed, because of erosion on top of the deposits, and the glaciated surface, covered in most cases by glacial drift, shows in a marked way the action of the glaciers, which at one time covered the country. No. 1 deposit may then be described as a greenstone hill, with a core of iron ore, and this will answer for all the deposits, except that the erosion may have reduced the hill to a plain in some cases. The drilling of 17 holes on the property shows that the walls of the deposits are practically vertical. The present knowledge oftheir depth is not very certain. The drilling that has been done has been across the deposits, in order to prove their width, and, incidentally, their depth. This drilling shows that the ore bodies are at least 400 feet deep, this being the deepest vertically that any drilling has been done. It also shows, that at depth, the ore is similar at any point, to that vertically above it on the surface, and that a sample taken on the surface in the same vertical plain as the drill hole, will be very closely similar in its physical and chemical makeup to the core from the hole. No vertical hole has been drilled in the ore body to the granites below. A vertical transverse section of No. 1 deposit where the width is, say 75 feet, would be about as follows:

	Feet.
Lean Magnetite, with bands of greenstone	15
Possibly a residual mass of greenstone	5
Magnetite, lean, grading up to very rich	25
Epidote	10
Magnetite, very rich, grading down to a fairly rich	20

It is quite characteristic of this deposit ore that the banding is with greenstone, and that practically no quartz is present; that the greenstone and epidote masses are found irregularly within the deposit, and that the ore next to the epidote mass is very rich, some of it being 70 per cent. metallic iron. There must have been some important relation, chemically in the enrichment of the ore, between the ore and the epidote. The presence of the greenstone displays no such effect. It is characteristic of all the deposits that they are lean on one side and grade to richer ore on the other. It is a difficult proposition to answer the question as to what the average metallic content of this ore would be. The ore is a hard magnetite of very great crushing strength, in other words, tough. It is made up of very fine microscopic crystals, so small, that crushing to 100 mesh does not entirely free one from another. There is no parting plane between the magnetite and the greenstone or epidote. The ore does not break free from the gangue, but it does break free from the walls of greenstone leaving a perfect contact wall, both foot and hanging. The ore when weathered is grey, darkgreen and black in appearance, and glaciated surfaces have the lustre of metallic iron. When broken, the ores have a steel grey appearance. The residual greenstone (and here it is assumed that the ore either replaced or entangled the greenstone), and the epidote are comparatively small masses, and have to be mined with the ore. A tram car of ore might be made up of some lean ore with greenstone banding, some very rich ore, some pieces of green stone and epidote, and every car would, because of different elements of which the ore body is made up from, differ much from each other. It is, therefore, not strange, that the attempt made to mine this ore and sort it by hand, was not a complete success. However, that was the plan, and in September of this first year, 1906, the erection of a crushing plant was commenced. The crushing plant, as has been before stated, was located on the slope of the hill known as No. 1 deposit. A chute down the side of the hill with a capacity of 20 tons or thereabouts fed the ore into a No. 6 Austin gyratory crusher. It passed from this into a revolving screen with $2\frac{1}{2}$-inch perforations, the undersize being elevated to a shipping bin, and the over size through a No. 5 gyratory crusher, and thence to the elevator and shipping bin, mixing with the undersize from the screen. From the shipping bin it was spouted into cars on the track alongside of the bin. This mill was completed during 1907. During this year and the next, the operations were not carried on very intensively, since the railroad was not completed, but development work up to the fall of 1908 had accumulated a stock pile of about 15,000 tons. This stock pile had been sorted by hand. The first ore was shipped in the fall of this year, 1908. It was prepared by again re-sorting the stock pile and crushing in the mill just described.

Some slabs resulted, since the product from the No. 5 crusher was not screened, and thus there were some pieces larger than the undersize from the screen, but they were few and no piece was larger than could be passed by hand through a 4-inch ring. Altogether, there was prepared of this, 3,568 tons.

This ore did not meet a favorable reception at the hand of the purchaser, for when it arrived and was unloaded at the Lake Erie dock, the purchaser inspected it and refused to take it. The great objection to the ore was, that it was too coarse, poor, physically. This ore was finally disposed of, and the analysis was as follows:

	%
Iron (dried at 212)	53.80
Silica	14.27
Moisture	24
Iron in natural condition	53.67

This ore was selected from the very richest portion of No. 1 deposit. It was sorted and re-sorted, and at considerable expense, and it was certainly disheartening to find, that it was only with a prohibitive cost that the ore could be brought up to merchantable grade, and that it had to be crushed yet finer.

It was reported in the mining centres at this time that the Moose Mountain venture was a failure, and it would have been had not the company at this time adopted magnetic separation. The concaves in the No. 5 gyratory was packed out by filling with iron back of them, to crush much finer. A twin revolving screen with 1-inch perforations was installed to screen the product from the $2\frac{1}{2}$-inch perforated screens and from the altered No. per cent. crusher. The oversize from this screen was returned to the No. 5, and the undersize was passed over a single drum magnetic cobber. A small generator and engine was put in to furnish direct current at 110 volts for the cobber. These alterations were made in the winter and spring of 1909. There was shipped of this magnetic cobbed ore in this year nine cargoes of the following average assay:

	212 F.	Natural.
Iron	55.77	55.34
Phosporous	1.07	1.06
Silica	12.78	12.68
Manganese	.09	.09
Alumina	1.58	1.57
Lime	3.77	3.74
Magnesia	3.52	3.49
Sulphur	.074	.073
Loss by ignition	none	none
Moisture	....	.77

A sieve test of this ore showed the following:

	%
On 8-ft. mesh sieve	79.53
On 20-inch mesh sieve	7.53
On 40-inch mesh sieve	2.64
On 60-inch mesh sieve	2.00
On 80-inch mesh sieve	.53
On 100-inch mesh sieve	.70
Three 100-inch mesh sieves	7.07

The ore is shipped from the mine to Key Harbour, on the Georgian Bay over the Canadian Northern Railway, a distance of 82 miles.

The ore being very dry and having considerable of it as fine as through 100 mesh sieve, presented difficulties at the unloading ports. The plaint of the first few boats was that they had difficulty in keeping a crew to unload. Finally one crew quit and after that the cargoes were wetted down before unloading. The ore as naturally prepared, has not to exceed 0.4 per cent. moisture, but the wetting down increases it to ¾ of 1 per cent. and 1 per cent. This remodelled plant was not of sufficient capacity, and was, in fact, a make-shift, but it enabled the company to try out the magnetic concentration, so that at the end of 1909, there was started the building of a much larger plant which was completed and put in operation in August, 1910.

This plant, which we now call No. 1 plant, made use of the No. 8 gyratory crusher of the old plant, and added along side of it, a 24-inch by 36-inch jaw crusher. The ore is conveyed from these crushers to a storage bin of 800 tons, which is then fed to No. 4 gyratory crushers. The product from these crushers passes through a 1¼-inch revolving perforated screen, the oversize being returned to the crushers and the undersize to storage bins by belt conveyers. The undersize is then fed from the storage bins to single drum cobbers the tails and concentrates being conveyed to shipping bins. The tails are taken by the railroad and used for ballast. In the old mill, there were only the two products from the magnetic cobber, concentrates and heads.

It was thought that even, were there not a cleavage plare between ore and gangue, it might prove advisable to take three products from the cobbers, concentrates, middles and tails, and re-crush the middles and treat them over belt separators. In the new No. 1 mill this plan was put into practice, but results did not warrant it, and it was discontinued. This mill was operated from August, in 1910, to May 31st, 1911, when it was shut down on account of the unsatisfactory ore market then prevailing, and at this time is still quiet. A stock pile of some 40,000 tons is now at the mine, and the dock has 13,000 tons stored there.

The total shipments from the mine, exclusive of that now in stock pile and dock has been 107,042 gross tons. The average metallic iron in the ore in the natural condition shipped in 1910 was 54.75 per cent., and the smaller tonnage in 1911 was 54.36 per cent. This ore was sold to nine different customers, and the following is the metallic iron per cent. in the natural condition, on which settlement was made, in each case, respectively, 54.17, 54.18, 54.18, 54.19, 54.20, 53.88, 54.58, 54.57, 55.53. The above shows with what great uniformity this ore can be prepared for market by the aid of the magnetic separators. One would be more than surprised to know that this was done without a chemist at the mine. It would be quite possible to sell ore on a guarantee that one cargo should not differ from another to exceed 2/10th of 1 per cent.

The ore met with general favour from the furnace men, but with the poor market conditions which came in 1910, objection was raised to the fine dust in the ore. At that time the company was planning putting in a plant after the Grondal process, and it was then determined, and has since been carried into effect, to screen all the dust out of the No. 1 ore and sending it to the Grondal plant, thus not electing any loss by reason of screening. The following is a sieve test of the present product:

	%
Held on 8-inch mesh	97.75
Held on 20-inch mesh	1.16
Held on 40-inch mesh	.11
Held on 60-inch mesh	.06
Held on 80-inch mesh	.02
Held on 100-inch mesh	.03
Passing 100-inch mesh	.87

That passing 100-inch mesh is probably due to dust adhering to the large pieces.

No. 1 deposit produces by magentic separation, a non-bessemer ore, ore averaging in the natural condition:

	%
Iron	54.35
Phosphorous	.090
Silica	13.94
Manganese	.06
Alumina	1.90
Lime	3.79
Magnesia	3.61
Sulphur	.029
Loss by ignition	.62
Moisture	87

all of which is crushed to maximum size of one inch and practically all of which can be held on an 8-inch mesh sieve, there being no dust.

In the separation with the cobbers, the phosphorous content is not affected, but the sulphur content is reduced to one-half of that in the crude ore. A determination of the tails resulted as follows:

	%
Iron	11.00
Phosphorous	.074
Silica	40.60
Manganese	.18
Lime	15.10
Magnesia	6.98
Sulphur	.027

Three-quarters of the total iron in the tails is magnetite. It requires the mining of about 1.35 tons of crude ore to produce one tone of the shipping or concentrated ore, and here is the only possible answer as to what is the average value of the deposit.

Earlier in this paper, reference was made of classifying the ores into two groups. No. 1 deposit, which has thus far been described is one type, and similar to it are deposits Nos. 4 and 5. These deposits run in a

northeast to southwest direction, and please note that they are at right angles to the other deposits of the other group which run in a northwest to southwest direction. These three deposits are adapted to the process just described, but you will observe that the tonnage in these deposits is small and that the great tonnage of ore on the property is in the other group of deposits. Typical and probably the largest of the other group of deposits is the one known as No. 2. The depth of this deposit is known to be at least 400 feet. It is of the banded variety of magnetite, the bands being of quartz, and while it grades from lean ore on one side of the deposit to richer on the other, it is not in such a pronounced way as in the other type. There is neither epidote nor greenstone included in these ores, as in the other group, but there is considerable quartz, which is entirely lacking in the other. Following is the analysis of a sample taken on the surface directly over the line of No. 4 diamond drill hole on this deposit:

	%
Iron	36.70
Phosphorous	.057
Silica	45.20
Manganese	.04
Alumina	.25
Lime	1.06
Magnesia	1.59
Sulphur	.024
Loss on ignition	.15

It is quite noticeable that the silica has increased from 14 per cent. in the other group of deposits to 45 per cent., and that all the other elements have decreased. During the past two years the company has been devoting considerable study and expense, in an experimental way looking towards the utilization of this very large tonnage in this group of deposits and is now in the process of building a plant, adapting the Grondal process. It would require a rather lengthy paper to give in detail the work done in this connection, but the test on the largest scale was carried out at Sheridan, Pa., the crude ore being very nearly of the same values of the analysis above. A thirty-ton sample was put through the grinding and separating machines and the result was:

	%
Iron	65.58
Phosphorous	.019
Silica	8.69
Manganese	.04
Alumina	.20
Lime	.46
Magnesia	.41
Sulphur	.029

This new plant, known as No. 2, is being built entirely of steel and concrete, and the expectation is that it will be ready for operation some time in May of this year. The capacity of the plant will be 800 tons per 24 hours of crude ore, and its output will be about 400 tons of briquettes. These briquettes will measure $2\frac{1}{2}$ x 3 x 6 inches and are of a very porous but sufficiently hard nature. The briquetting changes the magnetite, such that 90 per cent. of the briquette is in the form of hematite. The power throughout both of the plants is electricity, obtained from the Wahnapitae Power Co. over a transmission line 35 miles and at thirty-three thousand volts.

This year the company will produce the non-bessemer ore from No. 1 plant, and the briquetted bessemer low silica ore from No. 2 plant.

AN ELECTRICALLY DRIVEN PERCUSSION DRILL.

By Frank C. Perkins.

A novel German mining electrically driven percussion drill has been devised as noted in the accompanying photograph. It is held that this is the simplest percussion drill in the world and that the consumption of power is only $1\frac{1}{2}$ horse power at the same time it is equally suitable for all kinds of current.

It is further claimed that the performance is equal to that of the best drills driven with compressed air as holes of 30 millimeters diameter are drilled in the hardest granite at the rate of 6 oms per minute. There is said to have been developed an absolutely reliable reversing device for the drill and independent of the percussion mechanism with very simple protection of

the reversing device when the drill jams. The weight of the complete drill is 18 kilograms, and with this apparatus 1,000 blows of the percussion drill obtained per minute.

There is provided a flexible shaft 3 meters long with strong protective tube the electric motor for direct or rotary current, for all admissable voltages being mounted in a portable box and a cable terminal box is being utilized for the current distribution.

This electric drill operated by only one man made a hole in half an hour, whereas it is claimed two men would have required a week to do the work by hand.

It is maintained that the introduction of the percussion drill into the building industry in Germany has excited general interest, and, without doubt, the machine will be largely used in the building trades throughout the world just as it is already used in mines and quarries and has proved satisfactory in every way and economical in operation.

Mr. W. E. Finch, of Spokane, Washington, with associates, is developing, under option of purchase, the Idaho-Alamo group of silver-lead mines, in Slocan district, British Columbia.

QUARTZ MINING IN THE KLONDYKE DISTRICT

(Abstract of Report by D. D. Cairnes, in Summary Report of Geological Survey for 1911.)

Quartz veins are plentiful in the schistose rocks of the Klondike District, and although the greater number of these deposits are small and non-persistent, still the aggregate amount of quartz is very great. Occasional very encouraging assays have been obtained, but with rare exceptions it is not even approximately known what average amounts of gold the deposits in the different localities contain. The quartz is practically all free-milling and is but slightly mineralized, the only metallic constituents apparent being pyrite, and rarely magnetite, chalcopyrite, galena and native gold.

The Quartz Deposits.

A great amount of quartz occurs in the old schistose rocks that are so extensively developed in the Klondike district, and in some localities it is in sufficient quantity to even constitute a considerable portion of the whole rock mass. The quartz occurs prevailingly in veins which exhibit considerable variety of form, and are as a rule small and non-persistent, but range in size from mere threads to masses several hundred feet in length, but in most places less than ten feet in thickness; one vein, however, on Yukon River, below the mouth of Caribou Creek, exceeds 30 feet in thickness.

The most common type of vein is lenticular in form, the individual lenticles measuring but a few inches in thickness and less than 50 feet in length; in places, however, individuals as much as ten feet in thickness occur, but even these are rarely traceable for any considerable distances. The lenses in most places follow, in a general way at least, the strike of the schistosity of the containing rocks, but along their dips they frequently cut the wall rocks at various angles.

Typical bedded or sheeted veins are also characteristic of some localities; in this type of deposit the quartz occurs interleaved with the folia of the schists, the individual quartz bands being generally but a few inches in thickness; in places such deposits occur in zones up to ten feet or more in width that consist entirely of alternate quartz and schist lamellae exhibiting a wide range of relative proportions.

Typical fissure veins were also noted, but on account to the decidely schistose and fractured character of the enclosing rocks, these veins readily pass into the lenticular or sheeted types, due to the fact that the solutions from which the quartz was deposited, were naturally frequently diverted in whole or in part from the particular channels along which they might at any time be traveling, on account of the multitude of cleavage and fracture cracks which intersect these rocks, affording thus numerous routes for percolating waters. All types of veins are thus liable to bifurcate or branch out, and smaller veins frequently unite to form larger deposits. In places along lines of previous excessive fracturing, mineralized zones occur in which several of the vein types are represented; lenses, sheets, pockets and various irregular deposits of quartz may be separated by and include varying amounts of wall rock, and the whole be intersected by, or associated with, numerous stringers and fissure veins of quartz.

A notable feature of some of the veins is the presence in them of occasional feldspar crystals indicating their relation to certain pegmatites in the vicinity. In this connection Mr. McConnell says: "A few examples of typical pegmatite veins or dykes occur in the district, and in one case a coarse-grained pegmatite vein was observed to pass along its strike into a purely siliceous rock. The aqueo-igneous origin of the pegmatites, and their close genetic connection with certain classes of quartz veins, maintained by various writers, is supported by the facts observed in the Klondike district."

The quartz vens are in most places but slightly mineralized; pyrite and more rarely magnetite occur in places in sufficient quantity to produce a reddish coloration on the exposed and oxidized portion of the veins, and in a few places the quartz contains particles of galena, chalcopyrite, and native gold.

The Economic Importance of Quartz.

Often fair and occasionally even high assays are obtained, and in places the quartz shows native gold, but, except in possibly a very few insances, it is not known even approximately what average amounts of gold the quartz contains. From the various properties that have been examined however, the gold that does occur is always either associated with metallic sulphides or is at or near the contact between the quartz and schists; in the latter case the gold is generally found in both veins material and wall rock.

It would thus seem possible that some of the fractured zones that have become irregularly impregnated with quartz, may prove of greater value than the more clearly defined massive veins, since the former contain a greater area of contact-surfaces in the same volume or weight of material. However, the majority at least of the mineralized zones that have been examined, do not appear to be sufficiently persistent to allow of their containing sufficient quantities of pay-ore to make a mine; it is possible, nevertheless, that larger and more richly mineralized zones may yet be found. In a number of places several veins or mineralized zones which were noted in close proximity to each other could be worked conjointly. These would yield a considerable tonnage, and would become important producers if the bulk of the quartz will pay for milling. It is thought that, since the majority of the veins are non-persistent, the successful exploitation of the quartz of this district will largely depend on finding groups of veins or mineralized zones sufficiently close to allow of their being worked conjointly.

The deposits that have already been discovered in Klondike, in all probability represent but a small portion of the quartz that actually exists in the district, as bedrock is covered by superficial deposits in most places, except along the summits of the hills and ridges, and along the sides of the secondary valleys, where the bulk of the quartz occurs that has so far been found; other discoveries have been largely accidental and due frequently to placer operations. It is, therefore, probable, that future prospecting and development will disclose numerous deposits that are at present unknown.

More development should be performed, however in connection with the quartz deposits of the district that have been already discovered, with a view to ascertaining their extent, and more systematic sampling and assaying should be performed in order to determine within reasonable limits, at least, the average values of the materials they contain. It seems probable that at least the upper weathered and decomposed portions of

a number of the deposits could be profitably milled, due to the fact that the district has not been glaciated, and a certain surface concentration of gold is to be expected, and in places is known to occur.

Prospectors and others interested in lode mining frequently do not sufficiently realize the importance of assays, and when these are made, in probably the majority of instances in Klondike district, they are from samples that are not representative of the deposits from which they are taken. Two reasons seem mainly to account for this condition; one is that it is not as convenient to have assays made in Yukon as in most mining districts, and moreover it is frequently realized how difficult it is to obtain really representative assay samples from free milling deposits.

Mining Properties—General Statement.

Among the more promising quartz properties in the Klondike district, and those on which the most energy has been expended in development, are: the Lone Star group, near the head of Victoria Gulch, a tributary of Bonanza Creek; the Violet group, situated along the divide between Eldorado and Ophir Creeks, the Mitchell group, on the divide between the heads of Hunker and Goldbottom Creeks; the Lloyd group and neighbouring claims, situated along the divide between the heads of Green Gulch and Caribou Gulch, tributaries respectively of Sulphur and Dominion Creeks, and several groups of claims on Bear Creek near where joined by Lindow Creek. Of these the Lone Star was the only property on which any work, other than the necessary assessment duties, was being performed during the summer of 1911.

In addition to the above-mentioned properties, considerable enthusiasm has been aroused during the past two seasons over a number of claims staked on Dublin Gulch, a tributary of Haggart Creek which drains into the south fork of McQuesten River. This locality is not in the Dawson mining district, but is in the Duncan Creek mining district; it is, nevertheless, frequently spoken of as being in the general Klondike district and will be here so considered.

The Lone Star Group.

The Lone Star group is situated near the head of Victoria Gulch, a tributary of Bonanza Creek. This property is owned by a joint stock company with head office in Dawson and having acapitalization of $1,500,000; the President, Dr. Wm. Catto, as well as the Secretary-Treasurer, and the majority of the Board of Directors, also reside in Dawson.

On these claims two main veins, or really one vein and a mineralized zone, have been discovered, which have been, by the owners, designated respectively the "Corthay vein" and the Boulder lode"; these occur in much metamorphosed sericite and chloritic schists. The Boulder lode strikes N. 50° W.,[2] dips from 70° to 80° to the S.W., and is in most places at the surface from 3 to 10 feet in width, containing 1 to 7 feet of quartz. This "lode" has been traced definitely along its outcrop for 400 feet, and quartz is exposed at various paints in the same general line of strike for 600 feet farther, indicating that this zone may persist for this distance. The quartz occurs prevailingly in lenses, sheets and irregular bodies ranging in size from those that are only microscopically observable to others 3 or 4 feet in thickness; these are interbanded or interfoliated with the schists, and generally agree with them in strike, but along their dips cut the planes of schistosity of the enclosing rock at various angles up to 90°. In places masses of practically solid quartz as much as 4 or 5 feet thick occur, but such a condition is rather exceptional. Numerous fissure veins or stringers less than 6 inches in thickness intersect the main zone in various directions.

The Corthay vein strikes N. 14° W., has an almost perpendicular attitude, and where it has been explored is much more regular than the Boulder lode; this deposit also resembles more an ordinary compound fissure vein, and consists mainly of quartz which is in most places from 3 to 6 feet in thickness.

The quartz of both the Corthay vein and the Boulder lode is but slightly mineralized, the only metallic constituents that were noted being pyrite and native gold. The pyrite occurs as scattered particles or in small bunches, and is in sufficient amount in places to give the quartz a rusty appearance where weathered. The native gold occurs mainly as occasional grains and nuggets both in the quartz and wall-rock, but prevailingly near their contact, and is in places quite well crystallized.

An open cut about 70 feet long, 10 feet wide, and having an average depth of approximately 15 feet, as well as 8 or 10 smaller surface cuts or pits have been dug at intervals along the strike of the Boulder lode. A cross-cut tunnel 310 feet long has also been driven, from which, when examined in September, 1911, about 40 feet of drifting had been run on the Boulder lode which at this depth of approximately 60 feet was much narrower than at the surface and contained in most places less than $2\frac{1}{2}$ feet of quartz. A vertical shaft has been sunk through the schists and tapped the Corthay vein at a depth of 60 feet where the quartz was about 4 feet thick. Another shaft 40 feet deep has been sunk on the Corthay vein and was connected with a drift from the tunnel by a 30-foot upraise; a drift 70 feet long was also run from the bottom of this shaft.

A four-stamp Joshua Hendry mill has been erected on this property, and a gravity tramway 3,500 feet long has been constructed to convey the ore from the workings to the mill on the creek about 900 feet below. A power line 4 miles long was about completed in September, which was to convey power to the mill from the power line of the Northern Light and Power Company on Bonanza Creek, the cost of the power to be at the rate of three cents per horse-power.

Miners working on this property and in the vicinity receive $4 per day (10 hours) and board.

The manager of the Lone Star group claims to be able to mine and mill the ore from this property for $3.50 per ton. It is not known what average amounts of gold the quartz and adjoining rock there contain, but a number of promising assay returns have been received and the tests that have been made indicate that at least the somewhat decomposed superficial portion of the Boulder lode and possibly of the Corthay vein as well should pay to mill. No definite information was obtained concerning the remaining portions of the deposits.

The Violet Group.

The Violet group is situated on the divide between Eldorado and Ophir Creeks, about 5 miles from Grand Forks, and consists of four claims and a fraction, all of which are Crown-granted. It is claimed that $60,000 have been spent in developing this property which, however, was sold by public auction in September, 1910, and acquired by the present owner, Mr. H. H. Honen.

Three veins are reported to have been discovered on this property, but the bulk of the work has been done on one of these which strikes in a southeasterly direc-

This vein is in most places from 3 to 6 feet in thickness, and the quartz composing it is crystalline and contains considerable reddish feldspar, giving it a pegmatitic appearance. The quartz contains considerable iron, which, near the surface, weathers and gives the vein a rusty appearance; particles of galena were also noted. It is not known what amounts of gold this vein contains, but it is stated to average $10 to $11 per ton.

Three shafts, respectively 55 feet, 35 feet and 150 feet in depth, have been sunk on the property, and 300 feet of drifts have been driven; in addition, one open-cut 50 by 12 by 15 feet approximately, and a number of smaller cuts have been dug.

The Mitchell Group.

The Mitchell group is situated on the divide between the heads of Hunker and Goldbottom Creeks, and consists of about 27 claims which are owned by Mrs. Margaret J. Mitchell.

A number of quartz veins occur on this property, but as the surface of the ridge on which these have mainly been discovered is in most places covered with superficial materials, it is not known either how many veins may be present, nor even how many veins the known occurrences of quartz represent, as considerable stretches of bedrock are still covered between the different exposures. Quartz occurs in a number of small cuts or trenches more or less in alignment, that have been made on one part of the property at intervals throughout a distance of about 2,000 feet, yet this by no means proves that the quartz all belongs to the same vein; in places, trenches were sunk to bedrock across the supposed line of strike of this vein, and no quartz was encountered; and further, the exposures themselves are, in places, decidedly lenticular in form. For 600 to 800 feet, however, quartz has been found along a N. 5° W. direction wherever bedrock has been exposed to view, which is at frequent intervals; it would thus seem that for this distance either a fairly regular fissure vein or a nearly connected line of quartz lenses occurs. Other parallel lines of exposures were also noted, indicating that at least 3 or 4 veins, and, possibly, many more than this number, occur.

The quartz is all deposited in sericite schist, and whenever contacts between the quartz and wallrock were noted the quartz cuts the schist folia along both dip and strike. The veins range from a few inches to 7 or 8 feet, but are in most places from 2 to 4 feet in thickness; the quartz generally contains almost no metallic constituents, but in places exhibits considerable disseminated pyrite, which causes weathered surfaces to have a rusty appearance. A few particles of galena and native gold were also noted.

Only a few samples were taken from this property, but the results obtained from the analysis of these few all indicate that the white unmineralized quartz rarely carries more than traces of gold, which mineral almost invariably occurs either associated with the metallic sulphides or near the contact of the quartz and schist, and in either material.

The development work performed on this property consists mainly of a number of open-cuts, shallow trenches and pits, and also a shaft 80 feet deep, from which a 50-foot drift has been driven. The shaft was filled with water when visited, but a grab sample was taken from the dump, which assayed $5 in gold per ton; this is the highest assay obtained from the various samples taken by the writer from the Mitchell group, although much higher returns are believed to have been received from other samples taken previously. It, therefore, appears that, although the aggregate of quartz on this group of claims is considerable, by no means all the material will pay for treatment. The various veins should thus all be systematically sampled, to obtain an estimate of their probable average values, and determine approximately the veins and portions of these that will pay for mining and treatment.

The Lloyd Group.

The Lloyd group is situated at the head of Green and Caribou Gulches, tributaries respectively of Sulphur and Dominion Creeks, and consists of 17 Crown-granted claim owned by Messers, James Lloyd, J. A. Segbers, and Wm. Nolan.

A number of exposures of quartz 2 to 6 feet in width occur on this property, but in only a few places could the thickness of the veins, and their relations to the wall rocks be determined; the other known occurrences of quartz were either still more or less covered with superficial materials, or the various shafts, cuts, etc., that had at one time exposed the veins, contained considerable water or other materials that had drained or fallen in since the work was performed. One vein, however, was well exposed in a 25-foot shaft near the cabin; this deposit has an average thickness of about 3 feet, strikes N. 58° W., dips at angles of 60° to 70° to the N.E., and cuts across the foliation planes of the schist wallrock with every appearance, in the shaft at least, of being a typical regular fissure vein. The wallrocks everywhere observed are sericitic or chloritic schists.

The quartz outcrops on this property are in most places from 2 to 3 feet in thickness, and represent at least 3 or 4 veins and possibly more. In different portions of the claims exposures of quartz, approximately in alignment, were noted at various intervals extending throughout distances of several feet, but until more development has been performed it will be impossible to decide whether these lines of exposures each represent one continuous vein of several more or less connected lense-shaped deposits such as characterize the schistose rocks of that district.

The quartz is characteristically white and generally but slightly mineralized; however, in some places, the veins carry considerable disseminated pyrite which, where oxidized, gives the quartz a reddish, iron-stained appearance; occasional particles of galena were also noted.

Concerning the average gold content of the quartz, but little is known. The writer took only three samples from the different veins of the Lloyd group, and all yielded merely traces of gold. However, one of the owners of these claims had what he considered to be an average sample of one of the veins tested during the time I was in Dawson, and this gave $10.60 in gold to the ton; and other still higher assays are believed to have been obtained at different times. In this connection, however, it is to be remembered, as previously mentioned how extremely difficult it is to get satisfactory results from assay samples of low-grade free-milling ores; the samples taken by the writer may not be at all representative of the veins from which they were taken. To obtain reliable information concerning such ores, either a great number of assays must be taken, or mill tests must be made.

Considerable prospecting work has been performed upon this group of claims, mainly as follows; about 10 shafts, having an average of approximately 30 feet,

have been sunk, the deepest of these being down 56 feet when visited in September; in addition, a number of open-cuts and trenches have been dug.

Bear Creek.

A number of quartz claims, probably 30 or 40 in all, owned by John Nicholas and others, have been located on the right limit of Bear Creek near the junction of this stream with Lindow Creek. The schistose bedrock at different points on these claims, contains deposits of quartz impregnated with more or less pyrite, and in places showing particles of native gold that is occasionally quite crystalline. It is not known what average amounts of gold the veins in this vicinity contain, but it is claimed that a number of promising results have been received.

OBSERVATORY INLET, BRITISH COLUMBIA

By R. G. McConnell, in Summary Report of Geological Survey," 1911

(*CONCLUDED*)

"In addition to the numerous trenches and tunnels, the mineralized area has been further extensively explored with the diamond drill by the Granby Company, the present owners of the property. A number of long bore-holes, starting from various points alng the main tunnel and from the surface, have been drilled and have yielded valuable information in regard to the general character of the deposit.

"**Size and General Character of the Deposits.**—The mineralized area, as shown by the various surface and underground workings, is of great extent, although it has not as yet been fully defined, both ends being still unknown. In shape it forms a right angle. The smaller arm, known as the first orebody, has a northeasterly strike and dips to the northwest. It has been traced from the main tunnel in a southwesterly direction for more than 600 feet, the width averaging about 160 feet, or including a siliceous band which borders it on the northwest, of nearly 200 feet. The longer arm, holding the second orebody, has been traced in a northwesterly direction for a distance of 1,500 feet, with an average width of about 400 feet. The deposit has been proved by a borehole to a depth of 514 feet below the main tunnel, or approximately 900 feet below the surface outcrops on the hill.

"While only a portion of the large area described contains valuable minerals in sufficient quantities to constitute commercial ores, the original rocks are everywhere either completely altered into greenish or less commonly brownish bicaoeous schists or replaced by quartz and iron and copper sulphides. The transition from the dark, slightly-altered argillites, which constitute the country rocks, to ore is usually fairly abrupt, often occurring in a few inches.

"A conspicuous feature of the deposit is the presence of a zone of whitish quartz schists, practically strongly silicified argillites, traceable part way around it. This siliceous zone forms the northwestern boundary of the southwestern or smaller arm, crosses the deposit, then bending at right angles continues to the northwest as the northwestern boundary of the larger arm. It was not observed on the southwest border of the larger arm or the southeastern border of the smaller one.

"The rocks in the siliceous zone vary in the amount of silicification undergone. In most places they are nearly pure quartz schists, but occasionally the zone consists of alternating dark and white bands. The width of the zone ranges from 30 to 60 feet and more. The dip where it skirts the smaller arm and crosses the deposit is to the northwest, but after bending to the northwest the dip, as shown by the boreholes, changes to the northeast. It thus forms the hanging wall of both arms.

"**Mineralogy.**—The metallic minerals present consist mainly of iron pyrite, some of it cupriferous, pyrrhotite and subordinate qualities of chalcopyrite. A little bornite, evidently secondary, was found at one point. The principal non-metallic constituents are quartz, some calcite, a greenish micaceous schists, probably largely chloritic, some brownish schists, and occasionally some hornblende.

"Pyrite is the most abundant metallic mineral present. It usually occurs in a granular condition, and in places near the surface breaks down into an iron sand. It is always associated with more or less quartz and large areas consist of pyrite grains separated by a thin siliceous matrix. It also occurs in grains and small bunches distributed through the secondary schists. Its distribution through the mineralized area is irregular, some portions containing only a small percentage, while others consist almost entirely of sulphides and quartz. The main tunnel, started some distance down the slope from the mineralized area to gain depth, passes through 380 feet of argillites, all somewhat altered and containing occasional grains and small bunches of pyrite, then through a pyritic zone 200 feet wide, beyond which is a second pyritiz area which continues to the end of the tunnel 120 feet. A drift to the left from a point near the end of the tunnel running about north for 300 feet, shows the continuation of the pyritic area for that distance, the breast being in granular sulphides mostly pyrite, embedded in a siliceous matrix. A drift to the left passes through sulphides and quartz for 100 feet, then through greenish chloritic schists only slightly mineralized for 120 feet.

"The comparatively barren interval separating the two pyritic areas in the tunnel is not apparent on the surface, some of the ground overlying the lean portion being well mineralized with sulphides.

"Pyrrhotite, while much less abundant than pyrite, is common throughout the greater part of the mineralized area. It occurs intermingled with the pyrite and also forming comparatively large masses, usually specked with chalcopyrite.

"Chalcopyrite in grains, small aggregates of grains, in thin layers, usually accompanies the iron sulphides where the replacement is complete or nearly so, and also occurs in small quantities scattered through portions of the schistose areas. The proportion present, while variable, is always small and in certain areas seems to be absent altogether. The chalcopyrite is associated so intimately with the iron sulphides that there is little doubt that both are the products of the same period of deposition.

"Bornite was found at one point, but only as a surface alteration mineral, and it does not occur, so far as known, as a primary mineral of the deposit.

"Among the non-metallic minerals, quartz is the most prominent. A wide siliceous zone crosses and bounds portions of the mineralized area, and the large sulphide areas are all more or less siliceous. Calcite occurs occasionally, but is not prominent. Portions of the area included in the mineralized zone on the map accompanying this report consist of greenish micaceous schists often highly siliceous. These contain significant quantities of sulphides in some places and are nearly barren in others.

"**Ores.**—The iron sulphides in the Hidden Creek mine contain very low value in the precious metals. Out of a number of samples assayed in the laboratory of the Mines Department one showed 0.02 oz. gold to the ton, one 1.05 oz. silver, and the remainder only traces. The commercial value of the deposit must, therefore, depend mainly on the copper content. Chalcopyrite usually accompanies the iron sulphides, but in variable amounts. Some areas are nearly barren, while others contain sufficient quantities to constitute a log-grade copper ore—that is, ore containing up to three per cent. copper and, over limited areas, an even higher percentage.

"The most important body of commercial ore so far outlined by the company's boring operations occurs southeast of the siliceous zone previously described, as bordering the shorter arm of the deposit on the northwest and continuing along the larger arm. The siliceous zone is fringed by a band of ore usually from 20 to 25 feet in width and already traced for a distance of nearly 1,400 feet. A vertical borehole from the main tunnel apparently proves it to a depth of 514 feet below that level and it extends to the surface above, a variable distance, depending on the contours of the country, but probably averaging about 200 feet. The huge tonnage expected from this orebody will undoubtedly be greatly supplemented from other portions of the mineralized area. Workable ores are known to occur at a number of points, but the definition of their extent and quality awaits further exploration."

(**Note.**—It should be kept in mind that a full year's development work has been done at the Hidden Creek mine since Mr. McConnell examined the property and obtained data for his report. Another long adit has been driven, at a depth of about 150 feet below the 530-foot level above mentioned; all the workings alluded to by Mr. McConnell have been considerably extended, and much diamond-drilling has been done. A few weeks ago the Phoenix Pioneer stated the total amount of development work done on the Hidden Crek proprty to have been as follows: "Some 2,255 feet of cuts, 8,671 feet of drifts, and 1,051 feet of raises. The total of diamond-drill holes is given as 23,590 feet" The further extensive development of the property is in active progress, and much money is being spent in surface improvements, including buildings, railway shipping docks, development of hydro-electric power for mine and smeltery purposes, power equipment of mine, and work preliminary to the erection of a 200-ton-a-day smeltery. At the annual general meeting of shareholders in the Granby Company, held early in October, it was stated that "there has already been developed ore 'estimated in sight' to an approximate total of 5,000,000 tons, with an average copper content of 2.3 per cent. or 46 lbs. to the ton.)

"**Origin.**—The mineralized area at the Hidden Creek mine occurs in a larger predominantly argillaceous area surrounded and doubtless underlain, although at a considerable depth, by granitoid rocks, and cut by dikes and stocks belonging to the same period of igneous intrusion. The argillites were irregularly compressed and folded at the time of the invasion and the deposit probably occupies an area more than ordinarily crushed and fractured, although this has been masked by subsequent alteration and deposition, and is not apparent. A wide, broken zone, rather than a single fissure, is conceived to have afforded the means by which heated siliceous waters carrying iron and copper sulphides in solution ascended from the underlying batholith altering the argillites in their upward passage and replacing them with silica and sulphides as the pressure and temperature conditions became less severe.

"An origin of this kind would ally the deposit genetically with the loosely defined contact metamorphic group, although the ordinary contact metamorphic minerals, including the iron oxides, were not observed, and are either absent altogether or present only in very small quantities.

"Deposits of the contact metamorphic group, that is, deposits situated on or near the contact of igneous masses with sedimentaries and formed by ore-bearing solutions, either aqueous or gaseous, emanating from the cooling intrusive, vary widely in character. Ordinarily they are described as bunchy, irregular masses, made up mostly of iron oxides, and iron, copper, lead, and zinc sulphides, in a gangue of secondary silicates, mostly garnet, epidote, augite and tremolite. An examination of numerous occurrences at various points along the west coast indicates, however, that neither shape nor the presence of any or the majority of the compounds mentioned are essential features. The shape is dependent on the channel followed, and in a broken region perfect vein forms produced by the complete replacement of the country between parallel fissures are not uncommon. The constituents are also dependent on the character of the parent intrusive, on conditions of deposit, and possibly on the aqueous or gaseous character of the emenations, and gradations occur from masses of pure or nearly pure magnetite to others made up largely of tremolite and iron and copper sulphides, and in some instances of quartz and sulphides. The present classification, based only on a broad genetic relationship, is far from satisfactory. The name of the group is also misleading, as it included deposits far removed from the actual contacts."

Bonanza Group.

"This group is situated about three-fourths of a mile up Bonanza Creek, a small stream emptying into Goose bay about two miles below its mouth. Bonanza creek is a rapid stream about 20 feet wide, confined in a deep, narrow valley terminating below in a rock canyon 20 to 30 feet deep, excavated since the glacial period.

"The Bonanza group of claims, six in number, were the first claims staked in the district, and were explored to some extent by Mr. M. K. Rodgers before the discovery of the Hidden Creek group. Very little work has been done on them in recent years.

"The general character of the deposit on which the claims are staked are similar to that of the Hidden Creek group. The country rock is a dark, somewhat altered argillite cut by pegmatite and dioritic dikes, before it was mineralized, and by a later set of basic dikes it was mineralized. The argillites are altered

over a wide area into biotite and chloritic schists, some of it quite coarse holding variable quantities of pyrite, pyrrhotite and, in places, chalcopyrite. The sulphides are accompanied by some quartz, but this mineral is much less abundant here than in the Hidden Creek mine. The altered and mineralized area has a width of more than 400 feet, and is opened by short tunnels for a distance of 600 feet along its strike.

"The workings consist of three tunnels, one more than 100 feet in length, north of Bonanza creek, near the creek level and two tunnels and some surface work on the south side. The most westerly of the tunnels north of the creek cuts, near its mouth, 10 feet of granular pyrite, beyond which are micaceous schists holding only a small percentage of sulphides. Little copper is present. A sample of the granular pyrite gave on assay 0.48 per cent. copper, 1.25 oz. silver to the ton, and traces of gold. Some pyrrhotite holding specks of copper occurs in the middle tunnel. The east tunnel passes through micaceous schists sparingly mineralized with pyrite.

"The two tunnels south of the creek expose schists holding pyrite in scattered grains and bunches, and occasionally some pyrite. Some good-looking chalcopyrite ore is exposed in a cut near the creek, but further exploration is needed to determine whether or not it occurs in workable quantities.

"The Bonanza ground looks favorable enough to warrant diamond-drill exploration similar to that in progress with such good results in the Hidden Creek property. The area of altered schists containing iron and occasionally copper sulphides is very large, and the present workings cover only a small portion of it.

"A large quartz vein, fully 10 feet wide in places, occurs on the North Star claim, one of the Bonanza group. It holds some pyrite and chalcopyrite. A sample assayed yielded only 0.48 per cent. copper and 0.20 oz. silver to the ton. Around Goose bay a number of large quartz veins occur; most of these seem to be barren or nearly so."

(**Note**.—The Granby Consolidated Company is now developing the Bonanza group of 12 full and fractional claims under option of purchase. It was learned last August that diamond-drilling had been commenced, and that indications then were favorable for the property proving under development good enough for the company to purchase it.)

Redwing.

"The Redwing, staked in 1909 by Joseph McGrath, is situated about two miles up Glacier Creek at an elevation of 1,820 feet above sea-level. Glacier creek is a short, rapid stream issuing from a glacier which fills the upper part of its valley; the stream empties into Goose bay near its lower end.

"The country rock in the vicinity of the claims is an altered silicified green-stone, passing in places into a schist, lying between the argillites and the granite. Granite occurs a short distance to the south, and a wide dike or spur crosses the valley at one point.

"The claim is staked on a conspicuous oxidized zone in the greenstone running up the northern wall of the valley. The zone has a width of more than 50 feet in places, contains some quartz stringers, and is paralleled on the east for some distance by a strong quartz lead. A basic dike, made up largely of hornblende and fresh plagioclase and showing a diabase texture, crosses it at one point.

"The mineralization is similar to that of the other occurrences described, consisting of iron sulphide with some irregularly distributed chalcopyrite. The only development work done consists of a tunnel 25 feet long, driven into the face of the cliff near the centre of the oxidized zone. This passes through the basic dike mentioned above, then through six feet of nearly solid iron with some copper sulphides, the latter in grains and fair-sized bunches, then through micaceous schists sparingly mineralized. Chalcopyrite occurs both in the tunnel and at other points in sufficient quantities to constitute a good copper ore, but development work is needed to prove quantity. Assays of the sulphides are stated to show some value in the precious metals."

Red Bluff Group.

"Looking up the wide valley of the Kitzault river from the head of Alice arm, a red patch shows prominently on the face of a mountain north of the river, distant about 4½ miles. A number of claims have been staked on the red area, and grouped together under the name of the Red Bluff group.

"A short visit to the showing was made in company with Mr. Young, one of the owners, but as little development work had been done, observation was limited to the general surface features. A rough trail leading up the valley of the Kitzault for some distance, then up a tributary stream from the north, has been brushed out to the foot of the red bluff.

"The rocks in the neighbourhood of the showing consist mostly of fine and medium-textured, greenish, tufaceous sandstones alternating in places with bands of finer-grained, dark, argillaceous rocks. The tufaceous sandstones occur in wide, practically massive bands, showing little stratification. They are not much altered and consist mainly of rounded and angular feldspar grains, some quartz, and fragments of volcanic rocks.

"The mineralized area is very large, fully 1,000 feet in width and raceable for a long distance up the steep slopes of the mountain. The rocks are fractured and the pyrite oxidized to a greater depth han usual, and no large mass of sulphides is exposed on the surface. Copper carbonates in small quantities occur at a number of points, and a specimen consisting mostly of white pyrite in a siliceous gangue contained small specks of bornite. Some pyrargyrite in small grains was also found with pyrite in one exposure. This mineral does not occur, or at least has not been found, in the other large iron croppings of the district. A crust deposited by a spring bubbling up near the centre of the deposit was determined by Mr. R. A. A. Johnston, departmental mineralogist, as allophane, a hydrous silicate of aluminum.

"The economic importance of this large pyritized area is uncertain. It contains some copper, and while the small amount of surface work which has been done has not exposed it in commercial quantities, the prospects certainly warrant further exploration. The presence of the rich silver mineral pyrargyrite, even in small quantities is important.

QUARTZ VEINS.

Aldebaran, Black Bear, Etc.

"Quartz veins rich in silver occur on a group of claims, including the Aldebaran and Black Bear, located three-fourths of a mile north of the head of Alice arm, on the lower slopes of the mountains bordering the valley on the west. They were located in 1906, and the controlling interest is owned by Mr. Frank Roundy.

"The principal showing is on the Aldebaran and consists of stringers of quartz cutting the argillites for a

width of about 6 feet. The central vein has a width of 6 to 8 inches and a drift has been started on it. It is well-mineralized, while the bordering quartz stringers are nearly barren. The strike is northwesterly, and the dip to the southeast at an angle of 45 degrees. The minerals consist of pyrargyrite or ruby silver in noticeable quantities, argentiferous galena, pyrite, chalcopyrite, and sphalerite. The vein, where exposed in the short tunnel, runs very high in silver, but has only been followed for a short distance. A small cut 100 feet from the tunnel in the direction of the lead shows a quartz vein 3 feet thick, and quartz also occurs in cuts 250 and 350 feet distant. It is uncertain if the small quartz veins in these cuts represent a continuation of the rich vein at the tunnel or are different veins lying in the same fractured zone. They contain some value, but are less highly mineralized, and no pyrargyrite was noted.

Molybdenite Group.

"The Molybdenite group of claims is situated north of Alice arm, about a mile east of the contact of the argillaceous series with the granite of the Coast range, and at an elevation of 1,100 to 1,400 feet above sea-level. The argillites are associated with some coarse feldspathic beds probably of tufaceous origin, and by pre-granite, altered, greenish dikes.

"The showing consists of a series of quartz veins and stringers following a fractured zone striking in a northeasterly direction and traceable for more than 1,000 feet. The strike of the veins as a rule is parallel to that of the zone, but occasionally the veins cross the zone diagonally. They vary in thickness from a few inches up to four feet.

"The quartz veins contain molybdenite sometimes in considerable quantities, in scattered flakes, small bunches, and in lines parallel to the sides. Other minerals present in small quantities are iron pyrite, galena, and blende. A strong quartz porphyry dike which crosses the trend of the lead is slightly mineralized with molybdenite and cut by small quartz stringers.

"A specimen of the molybdenite-bearing quartz, assayed in the the laboratory of the Department of Minpes, contained 2.60 per cent. of molybdenite and traces of gold and silver. The owners state that fair gold value has been obtained from places along the lead.

Waterfront Claim and Others.

"The Waterfront claim is situated on the north side of Alice arm, about half a mile from its head. It contains a strong quartz lead about 6 feet thick, which outcrops near the water level and is said to be traceable in a northwest direction across the claims. It contains grains of iron pyrite, galena, and sphalerite, but is only lightly mineralized. Pyrargyrite is stated to have been obtained from it, but none was seen by the writer.

"A galena showing on a branch of Lime creek in the mountains south of Alice arm, and a large iron showing high up, west of Goose bay, were not examined, as at the time of my visit (June 23-July 15) they were still buried in snow.

Maple Bay.

"Maple bay is a small indentation in the coast of Portland canal, situated due west from the head of Goose bay on Observatory inlet. The argillaceous rocks of Goose bay extend westward across the mountain range separating Observatory inlet from Portland canal, and crop out along the shores of the latter in a wide band in the vicinity of Maple Bay. They become more altered in their extension westward, and the dark argillites are represented by greyish and dark micaceous schists and the included greenstone bands, both clastic and massive, by chloritic schists.

"The schists are cut in places by quartz veins, and one of these was mined on a considerable scale some years ago by the Brown Alaska Company. The vein worked is situated about a mile from the beach in a N.N.E. direction, and at an elevation of 980 feet above it. A road from the beach to the mine was constructed, a wharf built, and a number of buildings, including bunkers, erected at the mine and wharf, and a compressor and boiler-house at the beach. All of these are now rapidly going to ruin.

"The principal workings consist of a long tunnel measuring roughly 980 feet. The quartz vein was followed for 550 feet. It was then either lost or gave out, as little quartz was noticed in the last 430 feet. The vein strikes a few degrees east of north and dips to the east at an angle of 45 degrees. It consists mostly of quartz with some enclosed schist, and ranges in width from 3 to about 12 feet. The principal metallic minerals noted are pyrrhotite, pyrite, and chalcopyrite. The percentage of chalcopyrite varies, and only in places is present in sufficient quantities to constitute an ore. Small value in the precious metals is reported.

"Some stoping has been done and the ore shipped to a smeltery on Prince of Wales island, southeast Alaska. The general tenor of the ore was not learned. The mine has been idle for several years."

Note.—Under the name of the Outsiders group, this property has been described in one of the reports of the British Columbia Department of Mines.

THE HISTORY OF THE NICKEL INDUSTRY IN CANADA AND THE UNITED STATES

The history of the nickel industry formed the subject of an address delivered last month by Mr. David H. Browne, metallurgist of the Canadian Copper Company, before the Undergraduates' Society of Applied Science of McGill University. The lecturer stated that although nickel was discovered in 1751 it is only within the last few decades that its production has become a distinct factor in the mineral industry of North America. Until 1890 the two principal producing countries were Norway and New Caledonia; but since that date Canada has assumed the lead, and now easily occupies the premier position. The history of the Canadian industry is intimately connected with the activities of three men, namely, S. J. Ritchie, of Akron, Ohio; Robt. M. Thompson, of New York, and an Englishman named John Gamgee. None of the three in the beginning was aware of the existence of the others. In 1876, Gamgee undertook to build for tropical service a hospital ship, on which it was proposed to maintain a low temperature by means of ice machines. In connection with

this enterprise the difficulty presented itself that at the pressure employed ammonia gas leaked through cast iron. To overcome this a series of experiments with various alloys were conducted by Gamgee at Washington, and here he met Ritchie, who proposed the use of an alloy similar to meteoric iron. As a direct result the remarkable properties of nickel steel were discovered. But it was not for many years later that the value of the discovery was applied. Meanwhile Mr. Robert M. Thompson and his partner, Mr. W. E. C. Eustis, were engaged in developing a deposit of nickel ore in Oxford township, Quebec, but efforts to smelt the ore proving ineffectual, they abandoned the nickel enterprise and engaged in copper mining and smelting at Capelton. At first the matte was sold to copper refiners at Phoenixville, Pa., but later the partners decided to establish their own refinery, which was accordingly built at Constable Hook, New Jersey, and became known as the plant of the Oxford Copper Company. Shortly thereafter the partnership was dissolved, Mr. Eustis retaining the mines at Capelton, while Mr. Thompson became sole proprietor of the Oxford works, and as such, a buyer of copper ores. This was in 1885, about which year copper was discovered in the Sudbury district. In the year 1882, Mr. Ritchie became associated with others in the building of the Central Ontario Railway, to open the iron ore deposits of Hastings County. He subsequently advised the extension of this line to form a connection with the Canadian Pacific, and with this in mind visited the Sudbury district in 1885. Here he acquired options on a number of what appeared to be valuable deposits of high grade copper ore, on the strength of which he returned to Cleveland and organized the Canadian Copper Company. At that time the existence of nickel in this field was unknown. At this point, the lecturer remarked: "We have now the three threads of the nickel industry coming together and uniting. Mr. Ritchie, with his company ready to sell copper ore, which they did not know contained nickel; Mr. R. M. Thompson, coming forward to buy these ores, supposing them to contain nothing but copper and being himself prejudiced against nickel by his disastrous experience at the Oxford mine, and Mr. Gamgee, who had at this time vanished, but had left on Mr. Ritchie's mind an impression destined to have memorable results." Mining was commenced by the Canadian Copper Company in 1887, and 167 carloads of picked copper ore were shipped, part to the Nichols' chemical works and part to the Oxford works. The Nichols' chemical copper works being unable to make refined copper from the ores consigned to them, sent them to the Oxford works, where the same difficulty was experienced, investigation resulting in the discovery of the prsence of nickel. The problem then was, first, to remove this metal, to slag it out and leave marketable copper, and, second, but a far less important consideration, how to make nickel and how to make it profitably.

At this date the control of the nickel business was in the hands of the Societe le Nickel, operating the New Caledonia mines, owned by the Rothschilds, and practically controlling the nickel trade of the world, which then (1887) represented less than 1,000 tons a year. The New Caledonia ore was smelted with gypsum or alkali waste, yielding a nickel-iron matte, the iron being subsequently slagged off, leaving a pure nickel sulphide, from which the pure metal was obtained by roasting and reduction. A little nickel, from the nickel-copper ores of Norway, was also produced by the Vivians at Swansea, whose process was guarded with careful secrecy, while in the United States, ores from the Lancaster Gap mine, in Pennsylvania, were treated by Mr. Joseph Wharton, of Camden, N.J., in the production of nickel and cobalt on a limited scale. In 1882, however, Mr. Wharton was forced to abandon his enterprise by the Societe le Nickel.

"In general," to again quote verbatim, "it may be said of the nickel business at the time that it was suffering from an over-supply, and that its control was very lightly held by the French company. When, in this condition of the market a large supply of ore was thrown into the hands of men who knew absolutely nothing about the technicalities of the business or the conditions of the market, the outlook was at least doubtful and discouraging."

Meanwhile, Thompson had contracted to receive and the Canadian Copper Company had contracted to deliver, several thousand tons of ore containing about 15 per cent. copper. It was imperative that some means could be devised of slagging off or separating the nickel, and it was found that by repeated reverberatory smeltings the nickel could be successfully oxidized. Thus, a large amount of nickel-copper slags were accumulated, some of the copper being recovered in marketable form. After purchasing the Tatro patent for the treatment of nickel ores, the Oxford company continued its experimentations and finally discovered that if a copper-nickel-iron matte were melted with carbon and an alkali sulphide, two products were given: first, a "top" or lighter upper portion containing the major portion of the copper and iron with some nickel, and, second, a "bottom" or heavier portion containing the major portion of the nickel with some copper and iron; and that a comparatively clean seperation could be effected by repeated re-smelting of these products with more alkali-sulphide.

In the year 1888 the Canadian Copper Company decided to erect a smelter and to consign their product to the Oxford company in the form of nickel-copper matte, instead of as ore. This smelter was blown in on December 23 of that year. The furnace building was 35 x 40 feet, and contained one small Herreshoff furnace, 3 ft. 6 in. x 6 ft. at the tuyeves. In 1889, the company produced 8,450 tons of matte, which contained about 1,600 tons of copper and 1,200 tons of nickel. In this year the nickel production of New Caledonia was 1,332 tons, and consequently it was necessary to create a market for the new supply. In May, 1889, the Iron and Steel Institute published a report on the properties of nickel-steel, and Mr. S. J. Ritchie, recalling his own experiences in connection with the experiments of Gamgee, directed the attention of General Tracy, Secretary of the U. S. Navy, to the report in question. Investigations by both the United States and Canadian authorities followed, and resulted in a decision to adopt nickel-steel armour for the United States warships. Congress voting the sum of a million dollars to be devoted to the purchase of nickel. But while the investigations were in progress both the German and French nickel companies made overtures, which were rejected, to obtain control of the Sudbury nickel deposits.

In this year, 1890-'91, several other undertakings, notably the Vivians and the Dominion Mineral Company, commenced operations in the Sudbury district; but the smaller organizations were very soon driven out of business by the action of the French Nickel Syndicate in reducing the price of nickel to 1s. 1d. per pound. In fact, at one time, the Canadian Copper Company had over 9,000 tons of matte stored in the

smelter yard, and as the banks refused to accept overdrafts, the company would have been in difficulties but for the directors, who pledged their private fortunes in support of the enterprise. It was not until 1894, eight years after its organization, that the company found itself in a position to pay a dividend. This distribution was at the rate of 8 per cent. Meanwhile the company had decided to endeavour to refine its own products, and entered upon a series of experiments to attain that purpose. Among those engaged to undertake this work were Mr. Jules Garnier, who had erected nickel refineries in France, and Dr. Carl Hoepfner, both of whom, however, failed. The Mond proces was also investigated under option, but was not considered to be adopted to conditions in Canada. From 1892 to 1902 the Canadian Copper Company conducted a long and costly series of experiments in Cleveland, and finally succeeded in developing an electrolytic process which yielded satisfactory results, although not equal to those afforded by the Oxford process, and consequently it was abandoned.

In the year 1902, the International Nickel Company was organized, acquiring the interests of the Canadian Copper Company, the Anglo-American Iron Company (which, in addition to ironfields in Hastings County, owned valuable nickel properties to the west of Sudbury), the Oxford Copper Company, the American Nickel Company, the Wharton Refining Works at Camden, N.J., and the Nickel Corporation of London and the Societe Miniere Caledonienne. "This organization," Mr. Browne remarked, "brought miners, smelters and refiners to mutual understanding and made the way for many economics that could not heretofore have been effected. The strong competitors of the International Nickel Company are the old Societe le Nickel, with its New Caledonia ore deposits and its five refineries at strategic points in England, France and Germany, and the Mond Nickel Company, with its mines and smelters some 20 miles west of Sudbury and its refinery at Clydach in Wales. One of the first moves of the International Nickel Company was the gathering of the scattered furnaces of the Canadian Copper Company into one modern smelting plant. This smelter, which was modelled after the best copper smelting plants in the United States, was blown in in July, 1904. It was not, however, perfect in design for the requirements of copper-nickel ores, and only after two or three years of work and study were defects entirely remedied. Since then important additions and improvements have been made to the plant, which, although not so stated by Mr. Browne, is now recognized as a model of its kind in the world.

The company produces every year several thousand tons of copper and nickel in the form of a Bessemer matte, containing 80 per cent. copper-nickel. This matte enters the United States duty free, and is refined at the Oxford Copper Company's plant in New Jersey, where the necessary salt cage, oil, fuel, coal and chemicals can be obtained at figures very much below their cost in Canada, and where also ocean freights and competing railway connections reduce the cost of shipment to a minimum.

PERSONAL AND GENERAL

Mr. Alexander H. Smith, of the firm of Carter and Simth, 488 Confederation Life Building, Toronto, is examining properties in Eastern Ontario and will return to South Porcupine about December 1st. Mr. W. E. H. Carter, of the same firm, is in the West.

Mr. Benedict Crowell, of Crowell and Murray, Cleveland, Ohio, spent a week in Toronto recently in connection with some mining litigation.

Mr. J. B. Tyrrell sails shortly for London, England.

Mr. Ralph S. G. Stokes, of the Canadian Mining and Exploration Co., New York, was in Toronto last week. Our readers will remember Mr. Stokes as a frequent contributor to the technical press.

Mr. John Rooke-Croowell, late of California and Mexico, has accepted the position of manager of the Cordova mine, Hastings County, Ont.

At the Mann mine, Gowganda, really remarkable progress is being made. Under Mr. G. R. Rogers' supervision, the mine has produced more than $100,000 worth of silver since January of this year. This includes only the high-grade ore. Much mill rock has been produced. This will be treated when the projected mill is completed. The mine is only partly equipped and not more than 25 men have been employed. Hence the results obtained are unusually satisfactory.

Mr. John J. Penhale has returned to Sherbrooke after a month's absence in New York.

Mr. L. M. Adsit, manager of the Eustis mine, Eustis, Que., was in Montreal last week. The company is about to employ the Elmore oil process in connection with the treatment of the ore. The plant is being manufactured in Toronto.

On the eve of his departure from Cape Breton, Mr. M. J. Butler, C.M.G., formerly general manager of the Dominion Steel and Coal Corporation, was presented with an address and a testimonial by the Provincial Workmen's Association, while the district superintendents and other of the colliery officials presented him with a gold watch, suitably engraved.

The Maritime Mining Record remarks that much satisfaction is expressed by the employees of the Dominion collieries at the appointment of Mr. D. H. McDougall to the general managership of the corporation's coal and iron mines.

It is with very deep regret that we record the death which occurred on the 14th inst., of Mr. R. T. Hopper, of Montreal. Mr. Hopper had been identified with the mining industry for thirty-five years, first in connection with the manufacture of Portland cement, and later in the mining and production of asbestos and marble. He was a charter member of the Canadian Mining Institute, in which organization he took a keen and active interest. That his services to the society were valued is attested by the fact that he served as a member of Council for no less than nine terms, a record so far unequalled. A man of warm sympathies, generous-hearted, broad-minded, loyal and upright in character, the death of "Bob" Hopper, as he was affectionately termed among his intimates, is a sad loss. He fought an uphill fight against odds for thirty years. That having achieved success he should not live to enjoy its fruits seems hard, for he was but fifty-four when he died. Yet he had the consciousness that he left behind him the record of a clean and useful life.

The death occurred recently in Winnipeg of Mr. William Ogilvie, formerly Governor of the Yukon, and since associated with gold dredging in that territory. Before his term as Governor, the public service in the Yukon was disgraced by the corruption and thievery of its officials. Mr. Ogilvie removed this stigma, and by his own conduct set an example of efficiency and honourable dealing that has not been forgotten.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

Dominion Coal Outputs. The October output by collieries was as follows:

No.	Tons.
1	53,041
2	71,448
3	11,694
4	36,068
5	20,834
6	25,427
7	19,414
8	13,065
9	38,180
10	20,013
12	31,899
14	33,632
15	18,446
16	17,064
21	9,867
22	2,251
	422,343

No 1 Colliery had the best month for two years, and all the Lingan collieries exceeded their previous records, as did also Nos. 21 and 22 collieries. The total output for the month exceeded by 11,000 tons the best previous monthly production.

To the end of October the production for this year compares with 1911 as under:

	Cape Breton Collieries. Tons.	Springhill Collieries. Tons.	Total Dom. Coal. Tons.
10 months, 1911	3,322,291	194,965	3,517,256
10 months, 1912	3,743,705	350,491	4,094,196
Increase	421,414	155,526	576,940

During the first half of November, outputs have also been high, except during the first few days. To the sixteenth inclusive the production from the Glace Bay collieries totalled 220,000 tons, and the Springhill tonnages were also very good. On several occasions the Springhill output has exceeded 1700 tons, and on the 13th it reached 1782 tons, the largest day's output obtained at Springhill for a good many years..

It is hoped that the weather conditions this season will permit of navigation in the St. Lawrence river until a much later date than usual, and the Dominion Coal Company expect to despatch steamers up the river leaving Sydney 20th November, or possibly a few days later. In any case, the St. Lawrence shipments will be much larger this year than ever before. It is confidently expected that the Coal Company's St. Lawrence shipments in 1912 will reach over 1,600,000 tons, or 400,000 tons in excess of any previous season. In addition to this it is intended to send considerable quantities of coal to Montreal during the winter via Portland.

The combined output of the Dominion Coal Company's collieries will hardly reach five million tons in 1912, but it will go very close to that figure, probably 4,950,000 tons, or over 700,000 tons better than 1911.

Practically every one of the Nova Scotian collieries will register an increased output in 1912, and the Commissioner of Mines will be able to make up for his Government the largest royalty payment yet recorded.

The Bettington boilers at the Waterford Lake Power plant of the Dominion Coal Company are completed. At the first trial the No. 1 boiler gave a steam pressure of 50 lbs. within twenty minutes from the starting of the flame, notwithstanding that the brickwork was all damp, and that the crevices of the firebrick in the combustion chamber were not "slagged up." It is one of the features of this boiler that the brickwork of the combustion chamber is said to need no renewals after the first lining is provided, as the lining is automatically renewed by the deposition of molten slag. It is as yet too early to say what results may be expected from this entirely new type of steam-raiser, but the initial trials have so far been such as to justify sanguine hopes.

The tendency of modern steam-raising appliances seems to be in the direction of boilers fired by dust-fuel or gas, as enabling more perfect combustion than is possible by the burning of coal in the mass. Such boilers are also more easily regulated and can be operated with the minimum of manual labour. They can also be started at any time quickly from a cold state, without the necessity of banking fires.

Professor Bone, late Livesey Professor at the University of Leeds, and now Professor in the Imperial Institute of Science and Technology, London, is the inventor of a boiler which generates steam from the surface combustion of a mixture of air and gas upon various refractory surfaces. This boiler has given efficiencies as yet unparalleled by any other type of boiler, but your correspondent is unale to say whether Prof. Bone's invention is yet on the market. A great deal will be heard of this boiler in the future, and it is claimed that it will have a revolutionary effect on steam-raising practice.

The Dominion Coal Company's new Baum washer is completed and has been in operation since the middle of September. Work is now proceeding on the provision of large storage capacity for the washed product. A series of hoppered pockets are being constructed in reinforced concrete, which, when completed, will be capable of storing six thousand tons of washed slack-coal. The washed nuts which the washer separates from the slack-coal are an excellent product, and are without doubt the best blacksmiths' coal ever put on the market in Canada. Once the quality of these nuts is known and appreciated they will be in great demand.

A drilling crew with a Keystone churn drill have been occupied for several months past in boring for coal within the limits of the City of Sydney. A depth of somewhere over 400 feet is said to have been reached, but no signs of coal have been noticed. Seeing that the locality of the borehole is in the carboniferous limestone, outside the crop of the millstone grit and nearly seven miles outside the crop of the lowest workable seam in the productive coal measures, it does not seem probable that any coal will be struck. The parties interested are said to represent United States capital. They do not seem to have been well advised from a geological point of view. There are a certain number of people in this vicinity—as probably in every other coal country who affect to despise the findings and maps of the Geological Survey, and elaborate theories of their own that are at once the amusement and the despair of every practical mining engineer to whom they are propounded. Although actual working of coal seams and new openings will oftentimes necessitate slight alterations and corrections on the Geological Ordnance, there has yet to be discovered any serious error in the general plotting of the measures in the Cape Breton sheets, at any rate. Just why people will spend good money on looking for coal in such unlikely localities as the one referred to is difficult to understand.

ONTARIO.

COBALT, GOWGANDA, SOUTH LORRAIN

Nipissing.—During the month of October the Nipissing only mined $99,040, as their sorting plant at the Meyer had been closed down. The ore there was being held in reserve for the time when the low grade mill wuld be ready and the new washing plant there was not opened until the beginning of this month. The production this month will be above the average. The shipment of ore was slightly larger than usual, namely, $322,640. Development work at shaft 73 continues to give satisfactory results. The southeast branch of the main vein at the second level was drifted on for 110 feet and the ore averages 2,500 ounces over a width of three inches. At the third level this vein shows an inch of cobalt with small silver values. Another branch vein has been drifted on at the same level for 150 feet. It shows 2,000 ounce ore over a width of two inches and the face is still in good ore. Other branch veins show fair ore for a width of one to two inches. In the winze below the third level to the west good ore continued for 56 feet, though the Keewatin came in at a depth of 40 feet. On the main vein itself the east face at the third level still shows high grade ore. Eighty feet of drifting have been done on the faulted extension, and altogether 600 feet of drifting have been done at the third level with the face still showing well. Exploration work at shaft 64, shaft 56, near the Savage, and 63 shaft is proceeding satisfactorily. The discovery on the Seneca Superior lease at Cart Lake is considered important. The Nipissing possesses nearly all the territory round this lake and will proceed to develop here on a larger and more ambitious scale than heretofore. The conglomerate formation here is deep and now that the existence of a high grade vein here has been definitely established, the prospect for the whole vicinity is quite promising. At shaft 64 sinking has reached 477 feet. No level will be cut until the 650 ft. level is reached when exploration work will commence.

Seneca-Superior.—There appears to be no doubt now as to the value of the discovery on the Seneca-Superior lease of Peterson Lake. The vein has been drifted upon for 80 feet now and its width and values hold well. Two shipments of screenings will be made this month, the Peterson Lake Company marketing the ore and taking 25 per cent. of the gross receipts.

Bureau Returns.—The returns from the Ontario Bureau of Mines for the first nine months of the year show that the production is approximately a million ounces less, while the value is over a million dollars more owing to the fact that the average price of silver has been a little over seven cents an ounce higher. The figures for the first nine months of 1912 are 22,231,451 ounces, valued at $12,707,826. The ratio of decrease, if continued to the end of the year, would show a total loss of a million and a half ounces for the present year, as compared with 1911, and a gain of $1,671,135 in value, or 30,500,000 ounces.

English Capital in Casey.—Encouraged by the phenomenal success of the Casey Cobalt, several English syndicates having claims in Casey township are attempting to do a little prospecting. The difficulty lies in the fact that there is a very heavy overburden of clay above the conglomerate rock and that wherever there is an outcrop the Casey Cobalt has purchased the claim. The Casey Cobalt itself once attempted to do a little exploration work in a gully where it was hoped that the overburden would be light, but found that they did not strike bed rock until the drill had penetrated through 91 feet of the most fertile Temiskaming clay. Undaunted by this serious handicap one English syndicate is operating a diamond drill.

Beaver Discovery.—In cross-cutting at the 650-foot level the Beaver has opened up a 2-inch vein of 2,000 to 3,000 ounces ore in country farther west than they have ever found any good vein before. The Beaver is stoping and developing ore on eight levels, and is now cutting a station at the 700-foot level, the deepest working in camp. The exploration work in the diabase has been, on the whole, encouraging. Wherever veins enter the diabase they do not, or very rarely, lose their silver values, but the vein is split up into three or four stringers and the wall rock between these stringers carries a good deal of heavy leaf silver. Several veins that have never been worked at the upper levels have been found and are being developed at the 650-foot level, and both here and at the Temiskaming it seems pretty well established that veins do not necessarily lose their values when they are found in the diabase sill below the Keewatin. The 700-foot level of the Beaver will show whether the ore holds good for some distance away from the diabase-Keewatin contact; if it does, there is reason to hope for depth in this portion of the camp, as it is estimated that the diabase sill is from 600 to 800 feet thick.

Buffalo to Refine.—When the Buffalo mill starts running about the 20th of this month, another mine will be refining right on the premises the ore they mine in the drifts. The Buffalo mine is designed after the Nipissing high grade mill. It is intended to concentrate in the present mill and tram the product over to the smelter, where it will be refined and eventually shipped out as bullion. The refinery will have a capacity of between 300 and 400 tons per month.

Strike at Townsite Settled.—The Cobalt Townsite strike has been settled. The men did not at any time officially receive the support of the Western Federation and after two weeks of inaction they themselves voted to go back to work at the same hours and at the same wages.

PORCUPINE AND SWASTIKA

Gold Outpots.—The figures submitted by the Bureau of Mines for Ontario show that the gold mines of the Province have produced in the first nine months of the present year 53,488 ounces, worth $1,117,335, or more than double in value that for any preceding twelve months. The bulk of this has come from the Dome and the Hollinger. Other contributors were the Vipond and the McIntyre, also of Porcupine; the St. Anthony, of Sturgeon Lake; the Cordova mines, of Hastings county, and the Olympia, of the Lake of the Woods. Mr. A. A. Cole, the original Porcupine optimist, has just estimated in a report submitted to the commission that the camp would have produced two million dollars this year, but that was before the strike, and industrial strife will for a time, at any rate, upset all calculations and stop the output.

Powell Progress.—It is stated that while doing assessment work on the Powell claims in Deloro township a 2-foot vein of quartz has been struck. A test pit was put down on it and at 9 feet it was 8 feet wide with some native gold in it. It is also reported that assessment work on the Scottish Ontario has discovered another vein worth while developing, but there is no sign of the British company resuming underground operations.

Alexo.—The owners of the Alexo mine at Iroquois Falls have elected to continue their own development in spite of a tempting offer from an American syndicate

Altogether the company has shipped this year 1,920 tons of nickel from their little mine, and they intend to keep it up all winter. They will instal a small two-drill compressor and a 65 horse power boiler. At present all the ore is being mined by hand labour, the gang never at any time having exceeded eight men. The work so far has been all on the surface. Surface work this summer showed that the vein was broader than at first anticipated, where it has been opened up between the two shafts for a distance of 250 feet. All the ore has been shipped to the Mond Nickel Company at Victoria Falls, and owing to its high grade a better price has been obtained from the English company. When the small plant is installed underground work will be started. The undertaking so far has been quite self-sustaining and has shown a profit over and above all expenses, development and contemplated plant.

Dane Copper.—Development at the copper property of the Dane mining company has been disappointing. Underground operations have been abandoned on the lens of ore where the plant and camps were established and two diamond drills are operating on other properties. The ore was rich but very spotty.

In anticipation of the coming of the railroad into Elk Lake there has been a whirlwind of activity on almost all the prospects in the camp. The Beaver Extension is sinking a new shaft to cut into the ore-body found by the original operators. It was found impossible to operate from the old shaft. At a property known as the Cobalt Frontenac, in Tudhope, much excitement has been aroused by the report of gold in a drift. It is stated that the values run as high as $40 per ton. At Gowganda the prospects are not as rosy as last year. The Millerett, the first consistent producer in the camp has shut down after making a good profit over and above all expenses. The Mann is still making good progress. The Miller Lake O'Brien continues to be the sheet anchor of the camp and is looking very well, indeed. The Hudson Bay Mining Company had a disappointing year, but will continue operations this spring. They hope to get better values at a lower level.

Plenaurum and Pearl.—Excellent progress is being made with development on the Plenaurum and the Jupiter on Pearl Lake. The Jupiter is now working, but the one drill deeming it best to feel its way very carefully round the intricate fault and problems of that property. The winze below the 200-foot level of the Plenaurum is in excellent ore, while the vein is three feet wide. Drills are running on four veins in the long cross-cut below the lake and the results are very promising.

BRITISH COLUMBIA.

Ainsworth Mining Division.—In Ainsworth camp, work is in progress on the No. 1 and other properties under bond to the Consolidated Mining and Smelting Company of Canada, and on the Silver Hoard, the latetr being operated by Spokane men. Smeltery receipts from the Silver Hoard to the beginning of November were about 150 tons of ore, and more was being got out for shipment. No. 1 and other properties in the vicinity are awaiting the completion of the aerial tramway, now in course of construction down to Kootenay lake before more ore will be shipped. Of these properties, the general manager of the company reported at the end of the last fiscal year: "Options have been taken on a number of properties in Ainsworth camp. Some of these have been operated at intervals for a good many years, but most of them have been closed down for some time. These properties are the Highland group, No. 1 group, Maestro, Banker, Tiger, and Libby (adjoining the Highland group). Development and prospecting is being carried on on all of these groups, in the case of the No. 1 with very satisfactory results. In the other cases the work is not yet far enough advanced to give any definite results." That was the position several months ago; no additional information has since been made public.

At the Blue Bell, across Kootenay lake from Ainsworth, now that suitable equipment has been provided for exploiting the ground below the main adit level, a good tonnage of ore is being mined—about 200 tons a day being sent to the concentrating mill. The total quantity milled this year to November 1 was rather more than 20,000 tons, and it is estimated that production will be maintained at the rate of about 6,000 tons a month throughout the winter.

Mr. C. E. Caldwell, of Kaslo, states that approximately $50,000 will be the total value of the production in 1912 from the Utica mine, on Paddy's mountain, a few miles from Whitewater, this estimate including the expected production of November and December. The silver content of the ore is stated at 173 to 188 oz. and the lead 7 to 15 per cent. Production has lately been at the rate of two cars per week.

Leasers have been at work in the upper part of the mine, but toward the end of August they stopped mining and sacking ore to get in supplies for the winter, build a house near the entrance to the tunnel, and construct a wire tramway. It is intended to work the mine through the winter. Many improvements have been made on the property, which now has wagon-road communication with Kaslo by telephone.

The branch railway from Three Forks to Bera lake has been extended to Whitewater, and transportation facilities thereby been provided for the Retallack Co. property, formerly the Whitewater group. Development work is being continued in parts of the mines of this group, and preparations being made for shipment of ore whenever conditions shall be favorable for a resumption of production.

SLOCAN CITY MINING DIVISION.

It was lately reported at Slocan City that at the Ellis Silver Mining Company's Eastmont Mine, Ten-mile creek, another shoot of ore had been entered.

Somewhere about 200 feet of drifting has been done in the Lily B. In the course of this work pockets of ore of fair grade have been found occasionally.

Preparations were being made during the first part of November to rawhide ore down from the Black Prince mine to the Arlington road, whence it will be hauled to Slocan City for shipment, thence by rail to the smeltery at Trail. Mr. J. C. Moen has been engaged for about two years in developing this property, and now it is stated he has sufficient ore in sight to allow of rawhiding being continued throughout the winter. Eight or nine men will be kept at work at the mine. The ore from this mine is "dry" ore, and it is believed there is an excellent showing of ore that will run high in silver.

Some very high-grade ore has been shipped from the Meteor this year, and the lessees, Messrs. Barber, Wafer and Jameson, have about another car ready to send down to Slocan City. It is expected that work will be continued at this mine all the winter and shipment of ore will be practicable throughout that season.

The Neepawa has been leased by Mr. E. Shannon, of New Denver. Mr Beckett is pushing on with the development of the Slocan, Daisy, and Bird group, from

which he has obtained very encouraging assay returns, chiefly in gold.

On Lemon creek, Mr. Andrew Sostad has eight or nine men at work on the Kilo and the Chapleau 10-stamp mill. Ore from the Kilo is said to average about $14 a ton in gold, and some 25 tons a day is being put through the mill, running one shift. Prospects are thought to be promising for a revival of mining on Lemon creek, where there are a number of mineral claims it is believed will pay well for development.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS

The shipments of ore for the week ending November 23 include a remarkably large shipment from the Seneca-Superior lease of the Peterson Lake property, of which the owners receive one-quarter. Another newly-opened mine, the Penn-Canadian, sends out a large car of high grade, mostly concentrates from the mill, which has lately been started. The Penn-Canadian was the Cobalt Central.

The bullion shipments for the week were confined to the one mine, the Nipissing, which sent out 76,007.20 ounces of silver, valued at $47,574|50.

The ore shipments for the past week in tons were:

Peterson Lake	2 high, 1 low	114.13
Cobalt Lake	1 high.	33.00
Townsite	1 high.	25.15
La Rose	1 high. 1 low	34.60
Penn-Canadian	1 high.	'4.45
Crown Reserve	1 high.	29.61
Totals	9 cars.	320.34

A new shipper was added to the ranks when the Seneca-Superior shipped a car of low grade ore. The shipments for the week ended Nov. 16 comprised nine cars of high and one car of low grade. The City of Cobalt Mine made its re-appearance with one car of high. The bullion shipments were again up to the average. The totals are as follows:

La Rose, 2h.	130.249
McKinley, 1h.	57,700
Kerr Lake, 2h.	122,317
Peterson Lake (Seneca-Superior lease 1L.	60,800
City of Cobalt, 1h.	54,000
Hudson Bay, 1h.	61,878
O'Brien, 1h.	65,980
Wettlaufer, 1h.	60,520
Total	613,520

The ore shipments for the week and year to date, in tons:

	Week Nov. 15.	Year to date.
Bailey	.....	21.57
Beaver	.....	663.75
Casey Cobalt	.....	255.15
City of Cobalt	27.00	914..99
Buffalo	.....	989.50
Cobalt Lake	.....	827.88
Cobalt-Townsite	.....	1,641.37
Chambers-Ferland	.....	427.83
Coniagas	.....	1,874.33
Crown Reserve	.....	388.21
Drummond	.....	383.05
Hudson Bay	30.98	631.20
Kerr Lake	61.15	712.22
La Rose	65.10	3,113.15
Lost and Found	.....	27.80
McKinley-Darragh	28.25	2,307.43
Nipissing	.....	1,735.62
O'Brien	32.99	325.b3
Penn-Canadian	.....	63.45
Provincial	.....	22.22
Right of Way	.....	242.82
Temiskaming	.....	884.56
Trethewey	.....	474.69
Wettlaufer	30.26	406.96
Colonial	.....	6314
Dom Red. Co.	.....	56.64
Peterson Lake (Seneca Superior)	34.40	34.40
Totals	306.72	19,487.49

The bullion shipments were as follows:

	Ounces.	Value.
Nipissing	36,044.10	$16,258.03
Drummond	970.64	611.42
Crown Reserve	42,568.85	26,605.53
Nipissing	97,466.40	60,701.67
Totals	140,905.99	$87,918.62

The year's bullion shipments to date are as follows:

	Ounces.	Value.
Nipissing	3,468,358.07	$2,105,011.01
Crown Reserve	427,518.47	242,614.11
Temiskaming	38,782.00	23,165.10
O'Brien	188,617.94	112,873.61
Nova Scotia	49,010.00	31,800.00
Buffalo	82,157.00	48,914.54
McKinley-Darragh	80,327.00	6,069.37
Kerr Lake	21,463.19	13.081.95
Trethewey	20,637.08	12,416.16
City of Cobalt	5,659.94	3,133.20
Colonial	1,698.00	1,018.00
La Rose	69,849.00	41,030.88
Wettlaufer	3,280,62	2,003.14
Cobalt Lake	5,256.88	2,989.75
Right of Way	505.50	273.00
C. Townsite	6,282.55	3,867.00
Drummond	3,513.54	2,169.42
Casey Cobalt	940.00	574.00
Dom. Red Co	75,972.46	46,760.03
Miscellaneous	16,672.56	11,050.14
Bailey	14,050.50	8,816.65
Penn Canadian	445.00	282.69
Totals	4.570,904.95	$2,718,825.75

B. C. ORE SHIPMENTS

A feature of last week's ore production returns for the Kootenay and Boundary districts was the number of properties which returned to the list of producers after having been absent for periods ranging from a week to two months. Among these was the Standard, the Rambler-Cariboo, the Whitewater, the Nickle Plate in the Rossland district, the Jewel, the Molly Gibson, the St. Eugene and the Hudson Bay. For the week the production was 49,476 tons and for the year to date, 2,209.042 tons. Smelter receipts for the week were 43,561 tons and for the year to date, 1,984,376 tons.

Production and smelter receipts for the week ending Nov. 16, were:

East Kootenay.

St. Eugene	98	572
Monarch, milled	425	10,700

Other mines		28,019
Total	523	39,291

Slocan and Ainsworth.

Standard	119	7,457
Utica	79	759
Rambler-Cariboo	17	901
Whitewater	57	931
[illegible]	94	2,393
[illegible], milled	400	16,999
Van Roi, milled	1,100	51,400
Bluebell, milled	200	3,500
Other mines		14,561
Total	2,066	97,992

Nelson.

Molly Gibson	192	2,195
Yankee Girl	62	149
Hudson Bay	60	768
Mother Lode, milled	500	12,750
Queen, milled	400	15,500
Granite-Poorman, milled	250	12,350
Molly Gibson, milled	300	7,500
Second Relief, milled	250	5,250
Other mines		7,911
Total	2,014	64,369

Rossland.

Centre Star	3,066	139,942
Le Roi	910	40,552
Le Roi No. 2	482	22,767
Nickle Plate	35	75
Inland Empire, milled	90	1,800
Le Roi No. 2, milled	300	8,600
Other mines		206
Total	4,883	213,942

Boundary.

Granby	22,734	1,114,609
Mother Lode	7,640	330,020
Unnamed	234	10,302
Rawhide	6,884	220,880
Napoleon	513	10,789
Knob Hill	52	1,781
Jewel	45	74
United Copper	100	1,435
Surprise	128	5,150
Nickel Plate, milled	1,500	67,100
Jewel, milled	200	2,800
Other mines		28,598
Total	39,990	1,793,538

Consolidated Co.'s Receipts.
Trail, B.C.

Standard	119	7,457
Utica	79	759
Rambler-Cariboo	17	901
St. Eugene	98	572
Knob Hill	52	1,781
Centre Star	3,066	139,942
Le Roi No. 2	482	22,767
Le Roi	910	40,552
Whitewater	57	931
Jewel	45	74
Molly Gibson	192	2,195
United Copper	100	1,435
Yankee Girl	62	149
Surprise	128	5,150
Hudson Bay	60	768
[illegible]	94	2,393
Nickle Plate	35	75
Other mines		61,501
Total	5,596	279,402

B. C. Copper Co.'s Receipts.
Greenwood, B.C.

Mother Lode	7,640	350,020
Unnamed	234	10,302
Rawhide	6,884	220,880
Napoleon	513	10,789
Other mines		18,374
Total	15,231	590,365

Granby Smelter Receipts.
Grand Forks, B.C.

Granby	22,734	1,114,609

TORONTO MARKETS.

Nov. 25 (Quotations from Canada Metal Co., Toronto).
Spelter, 6.35 cents per lb.
Lead, 5.25 cents per lb.
Tin, 52 cents per lb.
Antimony, 12 cents per lb.
Copper, casting, 18½ cents per lb.
Electrolytic, 18½ cents per lb.
Ingot brass, 11 to 15 cents per lb.

Nov. 25—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $23.00 (f.o.b. Toronto).
Midland No. 2, $22.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75 per ton.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Nov. 22—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $3.90 to $4.00 per ton.
Foundry coke, prompt, $4.00 to $4.50 per ton.

Nov. 22—Tin (Straits), $49.65 cents.
Copper, Prime Lake, 17.70 cents.
Electrolytic copper, 17.50 to 17.62½ cents.
Copper wire, 19.00 cents.
Lead, 4.50 cents.
Spelter, 7.50 cents.
Sheet zinc (f.o.b. smelter), 9.00 cents.
Antimony, Cookson's, 10.15 to 10.25 cents.
Aluminum, 26.00 to 27.00 cents.
Nickel, 45.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $48.00 per ounce.
Bismuth, $2.00 to $2.25 per pound.
Quicksilver, $41.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
November 8	62⅝	28 15/16
" 9	62¾	29
" 11	62⅜	28 13/16
" 12	61½	28⅞
" 13	62⅝	28 13/16
" 14	62¾	29
" 15	61½	28⅞
" 16	62¾	29
" 18	62⅞	29 1/16
" 19	62⅝	28 15/16
" 20	62¾	29
" 21	62⅞	29 1/16
" 22	63	29⅛

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The Canadian Copper Company.

Copper Cliff, Ont., Jan. 17, 1910.

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Gentlemen:

Replying to your letter, inquiring as to our experience with Acetylene Lights for lighting in the mines, we would say that, after our first trial of Acetylene Lights underground five years ago, we found them so much superior in every way to any other light formerly used that we immediately procured lamps for all our stopes, both underground and in open pits.

We have used Electric Search Lights, Arc Lamps, and Gasoline Blast Lamps. The Searchlight localized the light too much. The Arc Light cannot be used in low back stopes, and cannot readily be moved out of danger from blasting. The gasoline torch gives off soot, and the light is not so white as that from an Acetylene Lamp, and with us this is important, as it is sometimes necessary to sort the Nickel and Copper ore, the two metals being indistinguishable except in a white light.

The Acetylene Lamp is extremely portable, and can be placed in the stopes in front of the men, and changed from time to time, as becomes necessary, without causing delay. No reflector is used and the light is evenly diffused.

We consider Acetylene an ideal light for underground stopes, and for this purpose we use them exclusively. We are said to have the best lighted stopes in the world.

The Milburn Lamp requires less attention, and gives more light than any we have yet tried. They are also perfectly safe.

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Yours truly,
John Lawson,
General Superintendent.

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PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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Mines and Mineral Lands Examined and Reported on
Port Arthur, Ontario, Canada.

HANDLEY, JOHN
Mining Engineer and Metallurgist
SUDBURY, ONT.
Code: Bedford McNeill, 1908.

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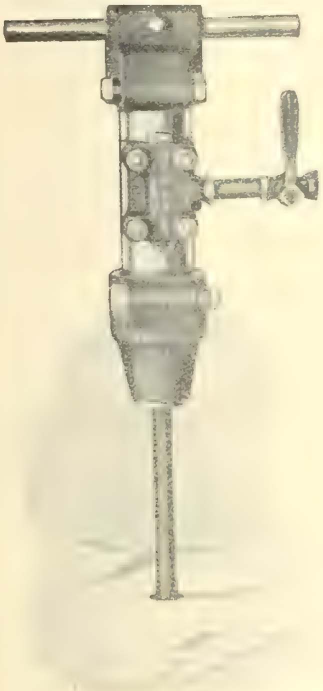

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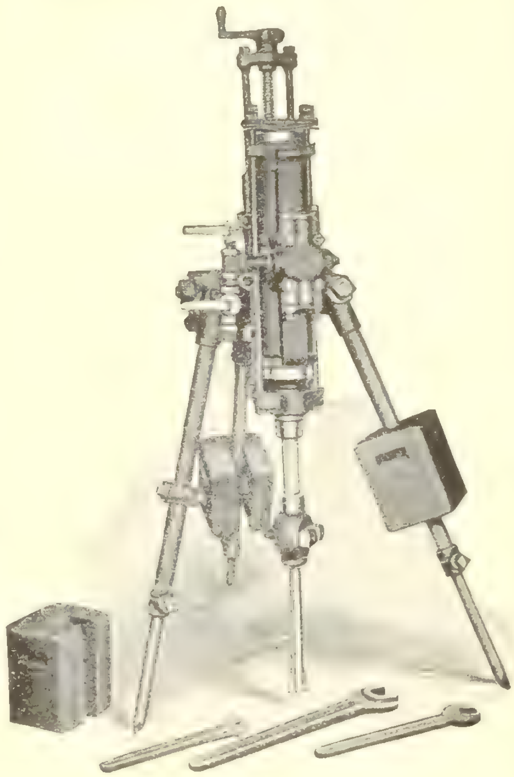

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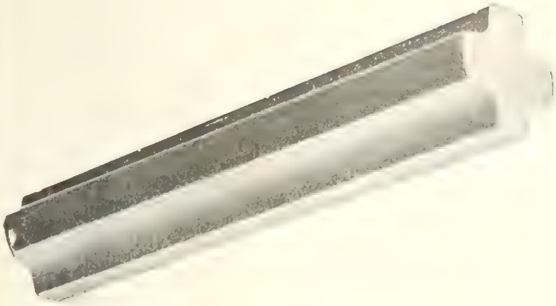

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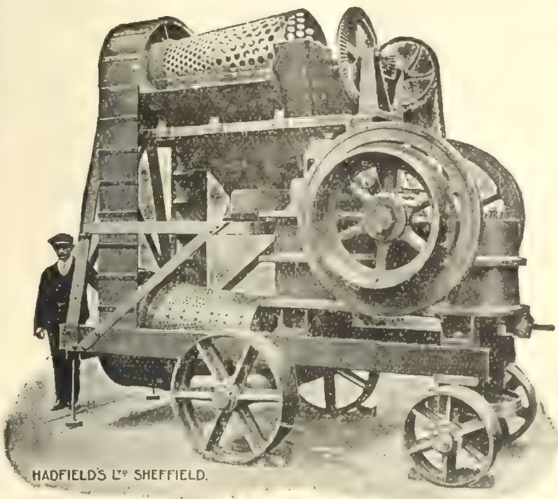

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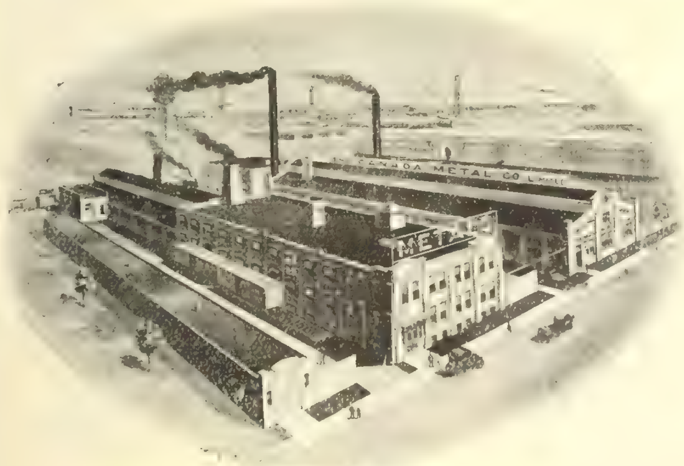

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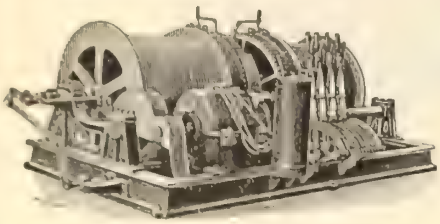

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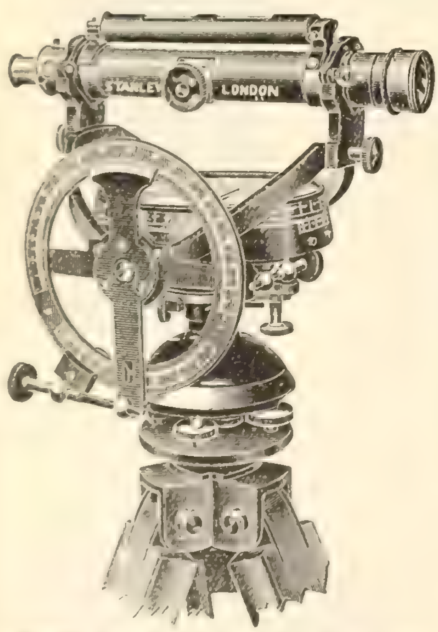

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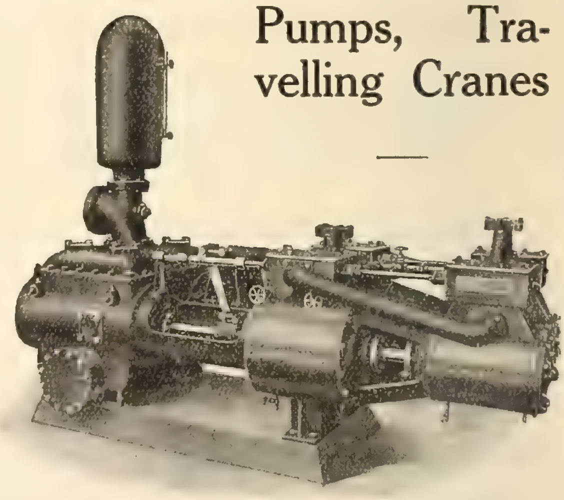

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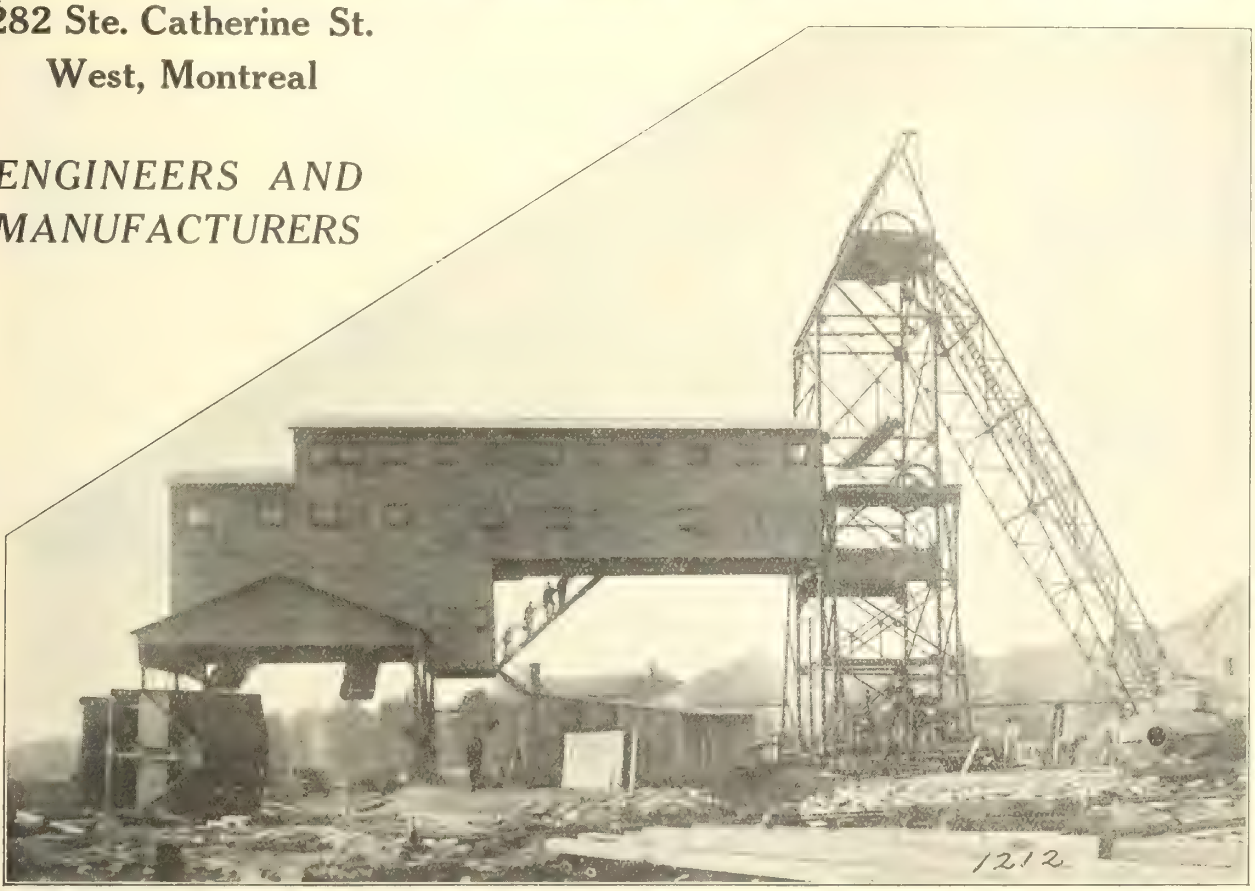

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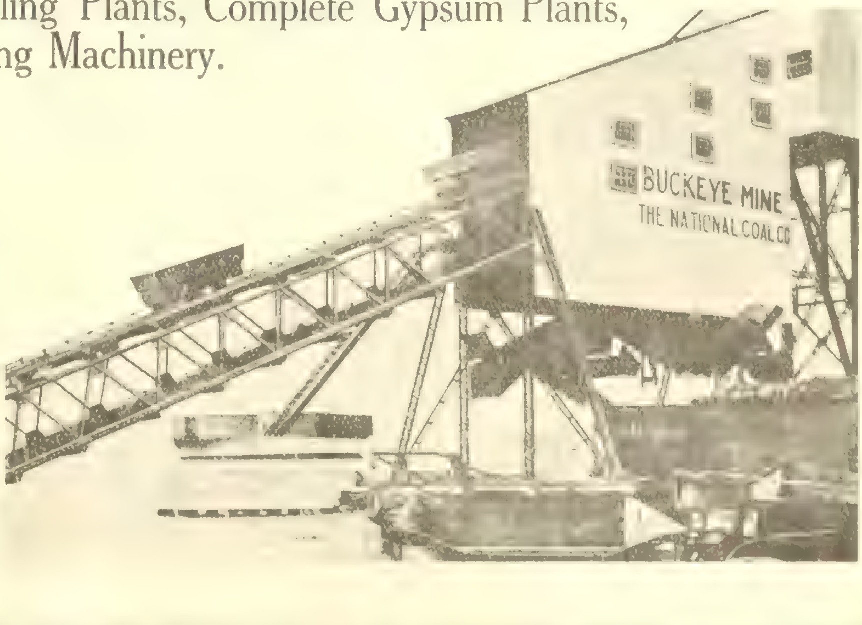

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CONTENTS.

THE NAVY

Rarely is it our duty to touch upon controversial political subjects, and it is with some diffidence that we approach the topic of the Canadian navy. While it is by no means our intention to discuss the merits or demerits of the lately introduced Naval Bill, yet there is one passage in the Rt. Hon. Mr. Borden's pregnant speech that demands comment.

In expressing so positively his opinion that Canada could not prepare herself for the construction of a navy within a quarter or even half a century, we are profoundly convinced that the Premier erred. And we shall proceed to give our reasons for this conviction.

Within the past two decades Canada has built up a strong, modern, and well organized iron and steel industry. In Nova Scotia the Dominion Steel Corporation has an enormous plant. The Nova Scotia Steel and Coal Company possesses at Trenton, near New Glasgow, a steel forging plant that represents the last word in modern practice. Raw material there is in plenty. Labour is obtainable as needed. The splendid harbours of Sydney and Halifax are commodious enough for any purpose.

On the Pacific coast, whilst the necessary industries have not been established, there are abundant sources of fuel, flux, and ore. In short, Canada possesses every natural facility for establishing shipbuilding industries on any desired scale.

As for the length of time in which such industries could be established, it is our opinion that, with suitable direction, not more than five, or at most, ten years would be consumed in preliminary work. There is no hidden mystery in shipbuilding. English and Scotch engineers could be engaged to direct the work. The fact that for some years the cost of construction would be higher here than in Great Britain is of no importance whatsoever. The gain to Canada would be immeasurably greater than any added expenditure in building. Employment would be given to thousands of men, new communities would spring up, the Maritime Provinces would be incalculably benefitted, and the whole industrial life of the nation would be strengthened.

Canada does not and will not for a moment regret the contribution of $35,000,000 to the British navy. This is but one meagre step in the right direction. But it is wrong to postulate as a reason for this contribution our inability to build our own ships. We have the ability, though we have not now the equipment. Problems as large as this have been solved in Canada by Canadians. The building of the Canadian Pacific Railway was, in many senses, a more arduous task. The construction of the Grand Trunk Pacific was probably more costly. The

proposed harbour improvements on the ocean seaboards and on our inland waterways will be still more costly. To stop short at this conjuncture, to refrain from completing the industrial cycle, is not the path of wisdom.

Another vital consideration is the fact that Canada possesses the only important coal deposits on tidewater in the whole hemisphere. These are situated, respectively, in Nova Scotia and in British Columbia. At present we have absolutely no means of protecting these in case of war. They would be absolutely at the mercy of a hostile fleet. In itself this is a serious enough fact to demand instant attention.

We hope, therefore, that the policy of the Dominion Government will be so modified as to encourage specifically the establishment of Canadian shipbuilding. Canada is ready and willing to help the Mother Country in any and all emergencies. Canada owes it to herself to make ready for the building of her own mercantile and war marine. This is doubly true if the Premier's opinion is correct. Fortunately, we believe that he has been quite misled.

SYSTEM OF MINE TAXATION

At the October meeting of the New York Section of the Mining and Metallurgical Society of America, the subject selected for debate was that of Systems of Mine Taxation. The discussion was opened by Mr. J. R. Finlay, who referred to four methods of taxing mining property of which he had knowledge, namely: (1) The plan in force in Michigan and Minnesota, of taxing on an ad valorem basis; (2) that followed in Colorado, Montana, Idaho, and Nevada, of taxing each year's net income over expenditures; (3) the United States government plan of taxing the net "profits" of corporations; and (4) that largely applied throughout the British Empire of placing a fixed royalty on output. Commenting on these several systems, Mr. Finlay remarked that while the difficulties in the application of the ad valorem method were considerable, they were not insuperable. What is needed in this case is a central authority ready and able to apply some well defined rules. In a mining community, taxes should be levied on a minimum valuation of land holdings and on all buildings and tangible assets, whether profitable or not, in some proportion to their cost. These taxes should be fundamental and could be made to cover local expenses. The mines themselves can be valued intelligently only after they have reached the profit earning stage. They can then be valued with fair accuracy, but should be re-assessed each year. This is not so considerable a task as would at first appear, for the number of profitable mines in each district which can be appraised for the value of their mining business *per se* is never very great. The work could be systemized by means of periodic reports, and by the inspection of maps and new developments. The other systems of taxation are at first glance somewhat more attractive on account of their greater apparent fairness. The weakness is, however, that taxes must be levied on property before it has become remunerative, taxes on profits alone can never be sufficient and can only supplement local ad valorem taxes of some description. On the theory that the business of a mining company, in contradistinction to its mere possessions, has value only if it is profitable, the system of taxing yearly revenue can be made absolutely fair; and the advantage of taxing net income is that it involves no necessity for making a valuation of the business. The recommendation in favour of royalty or "tonnage tax" is chiefly in the fact that it is broader in its scope than an income tax and that it is a harder tax to dodge.

Mr. H. C. Hoover remarked that taxation of mines in the British Empire rests upon an entirely different basis than that in the United States, and, moreover, it varies greatly in different portions of the Empire. In America the mining laws were formulated at the apogee of the economic theory of *laissez faire;* as a result, the minerals were freely alienated to the individual, and thus, under the economic sentiment of that period, the state or community reserved scarcely any right in the minerals. Hence, the object of taxation is purely for the necessary state revenue. In the British Empire the mining laws are to some extent either a survival of the period when the state or crown claimed an interest in all minerals, or have been formulated during these latter days when that claim has been revived. Moreover, the general basis of taxation throughout most of the British Empire is upon income and not upon capital. The tendency, therefore, is to employ taxation on minerals as a means to allow participation by the community in the minerals won, as well as to procure revenue. In some states, such as West Australia and the Transvaal, for example, taxation takes the form of rents on mineral land, fees for various state services, and so on, which at least partially support the local government; but, in addition, there is a heavy tax on profits, varying from 5 to 10 per cent. In some Indian states a gross royalty is demanded on minerals won, the origin of this system being mainly the conception that mineral ownership rests in the local prince, or the state, and that the working of mines pays tribute to the owner. Mr. Hoover's own view of a basis of taxation is that the right of the community to an interest in its minerals should be recognized. In the United States (and this also applies to Canada) in view of the alienation of the minerals, this right can be secured to the state only through some form of taxation; further, the miner should contribute his share to the cost of local government like all other members of the community. Respecting the form of taxation, he was of the opinion that any system based upon the capital value of mines is open to the strongest objection, because it throws upon the local, perhaps, unskilled official the highly technical work of mine valuation. A gross royalty on minerals won, although easiest of

assessment, is open also to objection, because it would bear with great inequality upon different mines. For example, a royalty of 20 cents per ton on a gold ore averaging $4 per ton might mean 30 per cent. of the profit won, while the same royalty on ore worth $50 might mean less than 1 per cent., and it is also probable that more capital pro rata would be employed in the first case than in the second. Furthermore, a gross royalty would in many cases be a tax on unprofitable mining and would handicap the industry. A tax on profit, with due allowance for depreciation, is, he considered, the fairest basis, and assessment becomes a matter of accountancy, which is within the skill of local officials. A small additional tax on improvements, for purposes of purely local government, would also be a necessity.

MINING ACCIDENTS IN ONTARIO

Bulletin No. 12, Mining Accidents in Ontario for July, August and September, 1912, has just been issued by the Ontario Bureau of Mines. Mr. E. T. Corkill, Chief Inspector of Mines, reports for the first nine months of the current year, fifteen fatalities below ground, and eleven above. These are distributed between mines, metallurgical works and quarries. It is gratifying to record that the present figures are much lower than those for the corresponding part of last year, when there were twenty-two underground fatalities and twelve above ground.

During the three months more particularly covered by the report, there occurred seven fatalities in mines, two at metallurgical works, and one in a quarry.

No less than 110 non-fatal accidents are reported for the third quarter of the year. This is much in excess of the third quarter of 1911, largely for the reason that a change in the Mining Act now requires that all accidents that incapacitate a man for seven days or more must be reported.

None of the fatalities in mines was due to the careless handling of explosives. One was due to electric shock.

In the main, the situation as regards accidents is improving. The policy of prompt official publicity is warmly to be commended.

A CORRECTION

A fortnight ago there appeared in the *Canadian Mining Journal* the statement that at the Jupiter mine, Porcupine, only one drill was working. The paragraph read as follows: "The Jupiter is now working with one drill, deeming it best to feel its way very carefully around the intricate fault, etc., etc." We have been advised authoritatively that this statement is incorrect. Drifting has been carried on to a point several hundred feet beyond the slight fault that was encountered some time ago. No intricate fault exists so far as is known, and the management has every reason to be satisfied with the results of work to date.

CHILIAN MILLS

In a very instinctive discussion of the Chilian mill, published in the latest bulletin of the Mexican Institute of Mining and Metallurgy, Mr. G. A. Denny and others express their opinions as to its efficiency. According to figures quoted by Mr. Denny, one slow-speed Chilian, with a daily output of 16 tons, showed 50 per cent. mechanical efficiency; whilst a mill running 14 per cent. faster develops an efficiency of 66 per cent., and outputs 26 tons daily. The discharge of the former was, however, in a finer state of comminution than that of the latter. Incidentally, the fact is brought out that the Chilian does far better work on a coarse feed than on fine. And, further, there is no advantage in slow speed, the high speed mill being demonstratably more economical and efficient.

Chilian mills, as compared with combined stamps and tube mills, have much to recommend them,—according to Mr. Denny. In initial cost, in output of fine material, in running expenses, and in cost of maintenance, the Chilian has everything in its favour.

Replying to Mr. Denny's criticisms, Mr. J. B. Empson, whose original paper is the basis of the discussion, concurs in the view that the stamp is not a grinder, but a fine breaker. He takes exception to the statement that, for Mexican ores in any case, the slow speed Chilian is less efficient than the high speed. The latter, he claims, is constantly getting out of repair. In fact, he looks upon the whole problem as not yet susceptible of solution.

EDITORIAL NOTES

At the Knights Deep mine, South Africa, all the newly installed crushers will be of the jaw type. Hammer drills are being used exclusively in the stopes.

Statistics published by the United States Bureau of Mines show that during the first eight months of 1912, 1,453 men were killed in and about coal mines in the States. In March the largest number of fatalaties per month occurred, there being 351 lives lost. April had the lowest figure, 73. Unless disasters of unusual magnitude occur between now and the end of the year, these figures signify that the death rate will be substantially lower this year than ever before. Last year the number of deaths was 2,719.

Of the total coal consumed in Alaska in 1911, which amounted to 122,000 short tons, 88,573 tons came from British Columbia, less than 1,000 tons being produced in Alaska. The remainder was shipped from the State of Washington.

It has been the boast of the American Institute of Mining Engineers that it was an international society, representing not only the mining profession of the United States, but also that of Canada and of Mexico. In view of this claim some surprise is expressed that contrary to

[illegible] in the past no provision has been made of late for a Canadian representative on the Council of this society.

The Alberta authorities propose adopting the broad-minded and sensible course of permitting men who hold either British or Canadian (Nova Scotia and British Columbia) certificates of competency to become mine managers or hold other positions of responsibility in the mines of the province, without passing the local examinations. This departure is to be entirely commended.

CORRESPONDENCE

THE MONOPOLY OF COAL

The Editor of The Canadian Mining Journal:

Sir.—My attention has been cald to your editorial comment of Nov. 15 on an address of mine which obviously you can not have red. You quote correctly enough a few words utterd by me, but, as you miss their intention, I will therefore leave unacknowledged the interesting series of left-handed compliments you pay me. Let me only say that to the average Nova Scotian it is amusing rather than offensiv to be dubd by a Toronto journalist "an uninformd and casual observer" of the affairs of his own province. Not that Toronto journalists make a practis of writing thus. On the contrary, but rarely.

The remarks to which you object is this: "We have pawnd our coal-mines to monopolists who take hevy toll."

Well, have we not? I ask. Indeed, you make no attempt to dispute either the pawn or the toll. Relativ to the latter, you are doutless aware that the Nova Scotian consumer has long been paying for coal at the mine a far higher price than that for which the same commodity is deliverd to the railway companies at St. Lawrence ports. You have fresh in mind, too, the fact of a recent advance of about sixty cents a ton to the Nova Scotian middleman, the only explanation tenderd the public being that there is a shortage in the United States, and, therefore, no danger, temporarily, at least, of American competition. These little incidents you would have us treat as merry jests, I suppose, harbingers of a merry Christmas—to the Toronto and Montreal coal-barons.

Next, as to the naked circumstances of our having deliverd our public proprietorship of the mines into the hands of working companies, no one has any fault to find with this. Our coal mines doutless are, as you are, competently workt. No other plan for their effectiv working could be suggested quite so convenient as the one we adopted many years ago.

But that is not the point of my observation. The whole tenor of my reflections was that at the different times when we were cald upon to effect leases of our mines our government was so starvd for revenue and our general economic condition so deprest that we were compeld for the sake of the stipulated royalties to make an arrangement with the prospetiv operations which faild to safegard our own people against just such extortion as I mention in a preceding paragraf. Any complaint I had to make was not of the method of operation of our mines or of the conduct of our local legislature, but of the policy of the federal government which goes on to this day taxing these provinces to such a [illegible] as forbids us obtaining more than a pittance of revenue for our educational and other provincial servises—a policy that had all to do with forcing upon us a very defectiv contract with the coal companies.

I am, sir, respectfully yours,

DAVID SOLOAN,
Truro, N.S.

COMPANY NOTES

HUDSON BAY DIVIDEND.

The Hudson Bay dividend of 300 per cent. was the eighth for the current year, bringing its payments for 1912 up to 2,400 per cent., and for the life of the mine to 22,000 per cent. It is a remarkable fact that all the dividends for the current year since the declaration of March 19th have been paid from the production of the dumps at the No. 1 camp. The work underground has been limited to a vigorous policy of development, and little stoping has been attempted. The Hudson Bay still has a large reserve of milling rock on its dumps.

THE COBALT LAKE CIRCULAR.

December 9th, 1912.

Dear Sir or Madam,—

I have been approached by a responsible English syndicate with a proposition that the shareholders of the Cobalt Lake Mining Company, Limited, should enter into an optional agreement for the sale of their shares.

The syndicate's offer, which is made to all the shareholders of the company alike, is to pay for 20 per cent. of each share holding in cash, the remaining proportion of the shares to be optioned at different prices as set out in an agreement, a copy of which is lodged with the British and Colonial Land and Securities Company, Traders Bank Building, Toronto, as trustees, where it can be seen by any registered shareholder.

I cannot give the option prices, because it is not usual or fair to do so in the case of an optional agreement, but full particulars will be given privately to any shareholders, verbally or by letter, on application, or at the meeting of shareholders to be held on the 20th December instant, of which notice has already been given.

I have carefully considered the present position of the property, and the conditions existing in the Cobalt stock market in Canada; I have estimated the physical condition of various Cobalt properties, as shown by their reports, and the stock quotations for the same, and have arrived at the conclusion that the prices and the terms and conditions contained in the syndicate's proposal are fair and reasonable and advantageous to the shareholders of this company.

I have accordingly agreed to enter into the agreement as far as I am concerned, and have deposited one million shares held by me with the Trust Company, and I have no hesitation in advising all the shareholders of the company to join in the agreement.

It must be understood that the Cobalt Lake Mining Company is not going out of business; the effect of the agreement is only to give the control of the company to the English syndicate, and an English company which will be incorporated by them; any shareholder who is not satisfied with the terms may retain his shares in the original company.

A meeting of the shareholders of the company, as above mentioned, is to be held on the 20th December instant, pursuant to notice already given, and all matters requiring explanation can be brought up and dealt with then; shareholders wishing to avail themselves of the syndicate's offer must send in their shares before January 10th, 1913.

Yours truly,

HENRY M. PELLATT,
President.

LITERATURE AND MINING

By J. C. Murray ,B.A., B.Sc.*

(Concluded)

Samuel Pepys was an official in the Navy Department in the reigns of Charles II. and James II. He was, also, an amazingly candid diarist. His diary, obviously never intended for publication, was written in a shorthand of Pepy's own devising. It covered the period 1660-1669. By accident it was not destroyed and it was included in the gift of books that Pepys bequeathed to Magdalene College, Oxford. Not until early last century was the shorthand deciphered.

Frequent illuminating allusions to mining matters occur in the diary. Nova Scotia figures in several of these. In an entry for May 13th, 1667, we find this: "This morning comes Sir H. Cholmly to me for a tally or two; and tells me that he hears that we are by agreement to give the King of France Nova Scotia, which he do not like; but I do not know the importance of it." A few months later, however, Pepys received more light, for he complains of the matter again, and characterizes as shameful the giving away of Nova Scotia, "which hath a river 300 miles up the country, with copper mines more than Swedeland, and Newcastle coales, the only place in America that hath coales that we know of." A river 300 miles long would, if crowded into Nova Scotia, assume roughly the shape of a closely coiled serpent. Also rumours of coal have come from other parts of the continent; but Mr. Pepys was not a stickler for trifles.

During the year of the great fire of London, 1666, Pepys notes the extraordinarily high price of coal in the city. The price per chaldron (25½ hundredweight) was £3 3s., and it must be remembered that the purchasing power of money was thrice as great then as it is now. But early in 1667 worse befell. Pepys, in the act of purchasing some newsbooks at Westminster Hall "did hear everybody complain of the dearness of coals, being at £4 per chaldron, the weather, too, being most bitter cold, the King saying to-day, that it was the coldest day he ever knew in England." The next day, sad to relate, was still colder. "This day," groans the excellent Samuel, "was reckoned by all people the coldest day that ever was remembered in England; and God knows! coal's at a very great price!" Harried as the coastwise colliers were by the Dutch fleet, it is not surprising to read that coal went up to £5 10s. in the following June.

A few sentences from his description of the methods used at the Royal Mint, and we shall have done with Mr. Pepys.

On the morning of May 19th, 1663, Pepys, to use his own good phrase, was "up pretty betimes." With a few friends he was shown over the Mint by the controller, and he takes pains to set down his impressions. He tells, among other things, how he "saw the manner of assaying of gold and silver, and how silver melted down with gold do part, just being put into aqua-fortis, the silver turning into water, and the gold lying whole in the very form it was put in . . . . which is a miracle; and to see no silver at all, but turned into water, which they can bring again into itself out of the water." Discussing all these things afterwards at dinner, the controller told his guests of one dishonest laborer who clipped coins and swallowed the clippings "down into his belly, and so they could not find him out." The thief was later induced to confess. His thievings amounted to £7. Another artisan made dies that produced facsimiles of old, worn corns, and thus gained 50 per cent. on his investment.

It is not inappropriated here to glance forf a moment at Lord Macaulay's vivid desciption of the condition of the mineral industry of England just about the period to which we have been referring. Tin was one of the most valuable products of the mine, the output from Cornwall being about 1,600 tons annually. Copper, however, was altogether neglected. Rock salt was not worked. "The salt which was obtained by a rude process from brine pits was held in no high estimation. The pans in which the manufacture was carried on exhaled a sulphurous stench." In fact, the residue was hardly fit for human consumption, and, as it was supposed to induce scorbutic maladies, it was used only by those who could not afford to buy the more expensive French product.

Since the manufacture of iron implied the wholesale destruction of forests wherefrom to obtain the necessary charcoal, the industry was no tencouraged. In fact, nearly all the iron used was imported, not more than ten thousand tons being made in Great Britain annually, a quantity equal to the output of one large modern furnace in less than a month. The art of using coal or coke had not, of course, been thought of.

Coal, the most important of all minerals, was very little used in manufacture. Few mines were worked that were not easily accessible by water, and London, so Lord Macaulay believes, consumed at least half of all the coal mined. As the capital is credited with requiring about 350,000 tons annually in the reign of Charles II. (and this quantity was thought to be fabulously large) one can compute the total without a ready reckoner.

It would be pleasant, of course, to continue multiplying such citations and quotations. Standard English literature, both prose and poetry, abounds in facts, fancies, and metaphors drawn from mining and metallurgy. Our vocabulary has drawn many cogent phrases and words from the mine. The whole course of history has been colored by man's desire for the products of the mine. The arts and the industries are based upon the miner's labor. Our remotest ancestors, shortly after they outgrew their tails, took to smiting each other with roughly smelted weapons of iron and copper. At the same time—I have to ask you to take my word for this—the female of the species recognized the decorative value of polished metals. And I doubt if this made for peace.

It is, I take it, quite superfluous to quote from Holy Writ. You all know of that first artificer, Tubalcain, of the metallic embelishments of the Temple; of that oft-misquoted and magnificent chapter in the Book of Job; and last, of the specifically mineralogical terms in which both places of future abode are described in the last book of the accepted canon.

All this, I doubt not, would be a work of supererogation. It will suffice for me to assure you that there are equally available and more modern works that can be used with profit. The essays of T. Sterry Hunt, the volumes of Sir William Dawson, many of the pamph-

*Editor of "*The Canadian Mining Journal*." [illegible]

lists of Dr. Henry Youle Hind, not to mention other noted Canadian scientists are pre-eminently worth while to the mining man. Moreover, when he wishes other stimulation, he can turn with profits to the pages of Parkman, who is to my mind the best of historians; or to Prescott, who deals with more southerly latitudes. In both, particularly in the latter, he will find that the romance of mining plays a considerable part.

The broad truth that I wish to impress upon you is that general reading is vitally necessary through all stages of our mental development. I fear that I have succeeded in submerging this truth in a flood of extraneous matter. Nevertheless it is a truth that cannot be ignored. The mining man who reads wisely and well is a better citizen than the mere technologist. He is also the better technologist.

THE SILVER HOARD CAVE

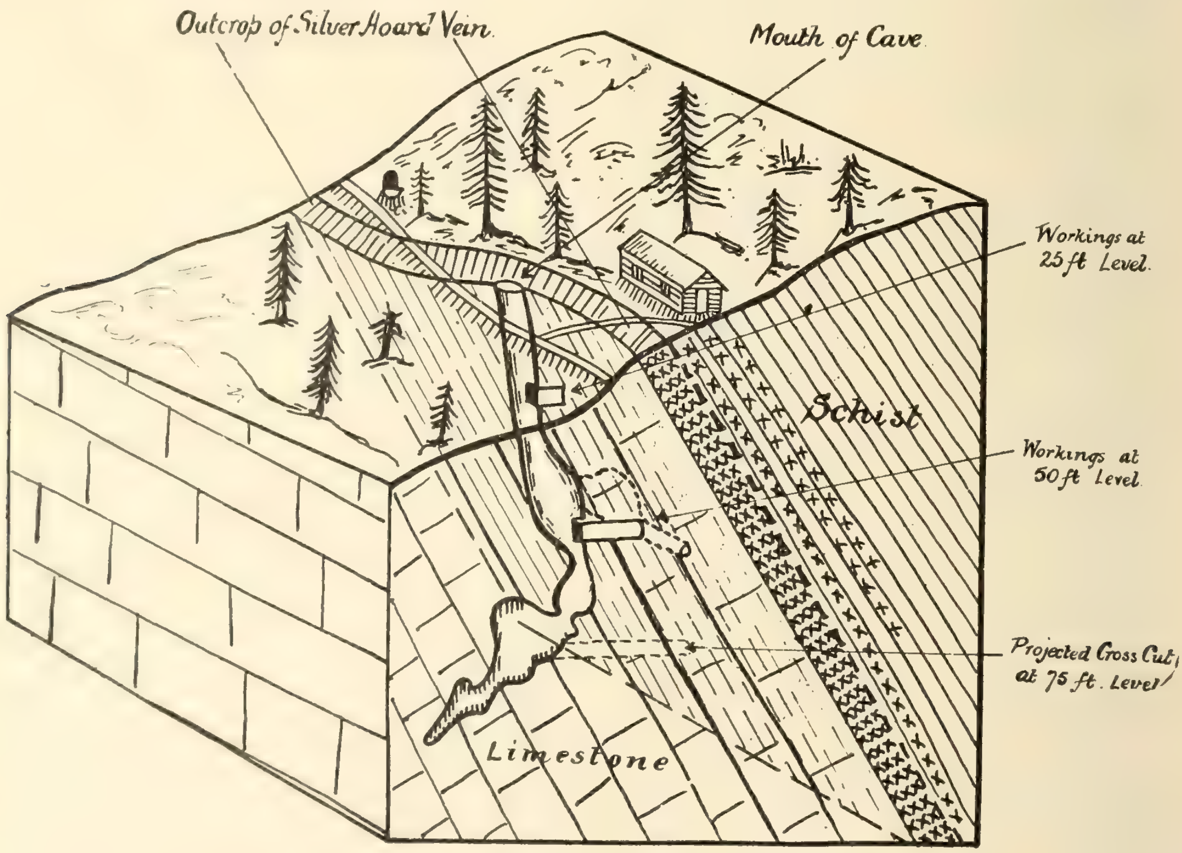
By Francis A Thomson, head of Department of Mining Engineering, State College of Washington, U.S.A.

The Silver Hoard Mines Company, operating a group of claims, situated about three miles from the old camp at Ainsworth, on the western shore of Kootenay lake, B.C., has recently uncovered a subterranean passage, which, in the relation it bears to the orebody adjacent to it, is probably unique in the annals of mining.

The relative positions of the cave and the vein are shown in Fig. 1, from which it will be seen that, for a considerable distance, the cave is practically a prospect-shaft in the footwall.

The vein is apparently a contact-fissure following the bedding plane between a belt of crystalline limestone and one of graphitic schist. At various points the orebody replaces the limestone footwall, and at others forms outliers along shear zones in the schist hanging-wall. The cave is confined entirely to the limestone and its mouth is practically in the outcrop of the vein.

The discovery of the cave makes a rather interesting story. Two of the principal owners of the property, Dr. E. R. Northrup and Mr. W. S. Hawley, both of Spokane, Washington, had come to look over the ground, and were examining a recent strike at the south end of the Dellie claim from which about ten tons of "carbonate" ore assaying several hundred ounces of silver per ton, had recently been taken. One of the miners—a Dutchman with an unpronounceable name—was hammering away at the face with a pick, anxious to make an impression by his diligence; suddenly the



Stereogram of Silver Hoard Cave
Ainsworth. B.C.

face fell inwards, the pick disappeared and the Dutchman barely regained his balance in time to avoid following it. As soon as he could get his breath he let a howl out of him and started for the bunk-house. On his way there he met the superintendent, Mr. E. E. Ward, to whom he announced: "By kolly, Mister Vahrd, we're up ajinst it." (At the Silver Hoard, "up ajint it" has since become a household joke). A rope was speedily secured and an exploration made, with the result that it was only a short time until the new "shaft" was equipped with skids and a whip, and a crosscut at the 50-foot level was being driven to catch the vein, which was intersected 15 ft. S. from the cave.

During a recent examination of the property by the writer, the cave was surveyed, using a Verschoyle pocket transit, and from the survey notes taken at that time the stereogram Fig. I was prepared.

The cave itself is evidently the result of solution of the limestone caused by surface waters seeping down fissures and joint planes. It is, of course, irregular in outline, following roughly the line of the joint planes. In some places it contracts to a narrow passage through which an average man can only pass with difficulty, and in others opens out to lofty chambers which, with their stalactite-covered ceilings are extremely impressive.

The stalactites themselves are interesting and unique, the usual tapering forms are, of course, abundant, but the occurrence of cylindrical tubes of calcite often 18 to 24 in. long with an external diameter of 3/16 in. and an internal diameter of 3/32 to 1/8 in. were entirely new to me. The miners call them "camaronis," which is rather apt, except that I have never seen macaroni as straight as these calcite tubes. Occasionally these tubes have sprouts or branches on them, due apparently to a stoppage of the tube and the leaking out of lime-laden water through the interstices between the radial crystals forming the tube-wall. A few of these sprouts were seen which had developed ridiculous-looking bulbous excrescences out of all proportion to the size of the parent stem.

It is evident that there have been several alternating periods of solution and deposition, possibly corresponding to some extent with seasonal fluctations of water-flow. Thus, in some parts the cave is almost impassable from the amount of stalactitic material; in other places the walls of the opening are evidently not those of the original cave, but are made up of the remnants of the stumps and other portions of partly dissolved stalactites, showing the re-opening by further solution of a passage blocked by stalactites.

Branches, both horizontal and vertical, are common and from the air currents it is evident that many of these reach the surface. There is at all times a considerable stream of water running on the floor of the cave and this can be heard continuing on its course beyond the present accessible limits of the chamber.

Skeletons of small rodents, driftwood, and other surface debris are frequently found among the boulders along the floor. At one point there is a deposit of soft oxidized material similar to the carbonates at the surface. An assay shows that this material contains about 30 ozs. silver to the ton. It may possibly, like the sticks and the rat's bones, have been washed in from the surface, but it looks in places more like a feeder from the main vein and a microscopic examination of the sample taken tends rather to confirm this view.

As an assistance in exploring the vein at this point, the cave is available as far as known at present to a depth of 75 ft. on the slope, or considerably more than this on the vertical, since it pitches into the hill, which is here quite steep. Below the 75-ft. point it swings to the eastward in a roughly helical form and departs from the vein too rapidly to make its use desirable. I believe, however, that it will continue to drain any workings which may be driven on a continuation of the present shaft (which is being enlarged to a two-compartment opening) to at least 100 ft. depth.

It is probable that below the limits of present accessibility the cave has other large chambers, and it may continue its present helical course until it again approaches close to the footwall; if such is the case it would, of course, make it of value for drainage purposes to still greater depth.

Although only in operation about one month the "cave-shaft" has already served for the extraction of between $5,000 and $10,000 worth of ore.

ELECTRIC SMELTING OF TIN IN ENGLAND

(From a London Correspondent.)

London, November 22, 1912.

The electric furnace generally is only making slow progress in the United Kingdom, although there are signs that that progress will be expedited in the near future. Perhaps the big obstacle to its development has been the comparative expensiveness of power in this country and this is a matter which the future may improve. As a matter of fact there are now many generating houses that can offer power, with a high consistent load factor, at a rate as low as 0.6c. per kw. hour. Within the last year or two some interesting developments in the way of electric smelting have made their appearance in Cornwall, and one trial smelting plant has been erected in that tin mining county of England for the reduction of tin ores on a scale not usual for this class of work in this country. At the first it might be supposed that the electric smelting of tin would have little or no chance as compared with the old established Cornish tin smelting; but the results of the trials suggest that this is not so. Metallic tin, and, consequently, also its ores, have such a high commercial value that every wastage is a serious loss. Now the losses in the ordinary coal-fired reverberatory furnace are considerable, and this is the case to an even greater extent in the shaft or blast furnace sometimes used in other countries. In a treatise by a German authority, Dr. Menicke, it is stated that the losses of metal in the slags and by volatization very often amount to as much as 8 or 9 per cent. The slags require, as a rule,a second treatment, but in spite of this losses amounting to 7 or 8 per cent. are not uncommon. The condensation of the flue dust is also complicated and costly and forms a constant source of trouble to the tin smelter. Another drawback to the use of the reverberatory furnace which is the one generally adopted in this country is the necessity for intermittent operation; loss in efficiency of the plant is thereby caused since the furnaces of necessity must stand idle

between the charges. Also the formation of "hard head" or impure alloys of tin through imperfect refining, is considerable.

Most of these disadvantages, it is claimed, can be overcome by electric smelting methods. The plant erected in Cornwall consisted of a specially designed electric furnace capable of dealing with about two tons (one ton equals 2,240 pounds) of ore a day, a suitable transformer, and appliances for the final purification of the tin. The power supply was three phase current, produced by oil engines for mining purposes, and although the costs of the power thus obtained were by no means so low as they would be for production by means of coal in other districts, they were not prohibitive. The furnace was designed for about 200 kw. or about 260 h.p., but only 90 to 110 kw. were available, else the daily output would have been considerably increased. The working of the furnace was absolutely steady, so that electric light could be operated off the same line without showing any flickering. As no combustion takes place in the electric furnace, only the theoretical amount of coal necessary for the reduction had to be added, or about 14 per cent., instead of the 22 or 25 per cent. (with Bolivian ore even more) required by the reverberatory process. The furnace being practically closed, losses from volatization were practically eliminated. In fact, tests made over a week with a temporarily arranged condensing tube proved that less than 1 per cent. escaped in this way.

The tin contained in the slags could be made to vary at will; in some cases slags from the "first melt" were produced, containing only 0.25 per cent. of metallic tin. But it was found that the output of the furnace was somewhat reduced when such slags were produced. It appeared better to work two furnaces in series, the first or primary furnace being charged with ore direct and operated so as to give a large output, thereby producing a slag containing up to 15 or 18 per cent. of tin, which was subsequently treated when still hot in a second furnace, where the tin contained in the slag was reduced to only 1¼ or 2 per cent. This procedure has also the advantage that, the total amount of slag being comparatively small, the second furnace could be made of smaller capacity and worked with a reduced output. If necessary, the slags can be worked together with lead ore or galena in this furnace for the production of tin solder, and in this case it is quite possible to extract practically all the tin present. As fumes are almost absent the process can be carried out in places where, for sanitary reasons, such operations are now forbidden. Another item of great importance is that very few repairs to the furnace are required. The brickwork in the trial furnace mentioned was intact at the end of the trial, after running day and night for many weeks, with various severe tests under difficult conditions; in fact, the bricks could be utilized as building material after the trial was concluded.

Altogether about 20 tons of metallic tin of a purity of 99.5 per cent. (hence even purer than ordinary tin on the market) were produced during the trials. The average power consumption was about 2,000 kw. hours per ton of tin, btu many runs were made with only 1,500 kw. hours per ton. In a larger plant, running regularly as a working concern, the power consumption may be expected to be so low as 1,400 kw. hours per ton of tin. Calculated at a price of 0.3 pence (06 cents) a unit, the power cost would thus be one pound fifteen shilling ($8.75). The labour cost is also reduced as three men and a boy can easily handle a furnace turning out ten tons of tin a day if suitable appliances for handling the ore and the metal are provided. This, of course, refers to the smelting furnace proper, and does not include the men necessary for the subsequent handling of the metal. Actual figures of the smelting costs of the present system with the reverberatory furnace naturally vary considerably, according to the size of the plant, location, etc., but the figures given above suggest that a decided saving may be secured by the electric process. In addition to this, the electric smelting plant works under more efficient conditions, seeing that the process is absolutely continuous day and night for months, whereas the ordinary furnace has to be shut down after each melt for recharging and repairs.

CHILIAN MILLS*

By G. A. Denny.

My first Chilian mill experience was, whilst still a student, in 1885, on a plant in South Australia, in which my father was using Chilian mills for grinding, followed by grinding pans, of his own design, which are still largely the vogue in Australiasia.

In 1905 I prepared provisional plans for a Chilian mill plant for one of the principal deep level mines of the Rand, but these, however, owing to the dislike on that field for so-called "experiments," were not adopted. In the same year I prepared for the first meeting of the Mines Trials Committee what I termed an "Ideal" plant for the treatment of Rand ores. In this plant Chilian mills were substituted for stamps. Drawings of both these schemes are submitted herewith. Seeing, therefore, I am very much interested in the Chilian mill, I am very glad to respond to Mr. Empson's invitation to take part in a discussion on his paper.

Although Mr. Empson deals specifically with the slow speed Chilian mill throughout his paper, I cannot find any but passing reference, as to the reason why a slow speed machine should be better adapted for Mexican practice, than one of moderately high speed. Neither have I been able to find in Mr. Bayldon's paper, from which Mr. Empson so copiously quotes, any evidence that the slow speed mill has any advantages over one of higher speed. Mr. Bayldon plainly says, that if the speed of his mill had been increased by 43 per cent., its output would have increased in almost exact ratio, namely by 47.5 per cent. He also shows that by increasing one of two mills of the old slow speed type, by 14 per cent. in the number of revolutions he increased its capacity by 62 per cent., the main reason for the increase he thought, being the more violent agitation of the pulp in the pan.

I have calculated the mechanical efficiency of these two mills from Mr. Bayldon's figures, and find that if we take 8 h.p. for the slow speed mill, which is just above his limit for power absorbed, and 9.5 h.p. for the faster mill, the relative mech. effs. work out as under.

*[illegible] Institute of Mining and Metallurgy.

No. 1 mill, slow speed. Mechanical efficiency 50 per cent. Output 16 tons daily.

No. 2 mill, 14 per cent. faster speed. Mechanical efficiency 66 per cent. Output 26 tons daily.

The respective mechanical energy units represented by the discharge of the two mills, after allowing for the value of the feed, are:

No 1 mill...............25.16 Energy units.
No. 2 mill...............24.33 Energy units.

An examination of the discharges of the two mills, shows, however, that the slow speed mill was making a slightly finer product than No. 2 mill, but at the cost of a greatly reduced output. There is, therefore, a critical limit somewhere between the smaller tonnage output of fine material, and a larger tonnage output of coarser material, at which the mill works most advantageously, if not most efficiently. Unquestionably a very important factor, given other favourable conditions, is the size of the feed to the mills. It is a very current, but wholly mistaken idea, that a Chilian mill has a larger output if fed with fine material, than with coarse. Contrariwise, it has a considerably higher output on ore fed direct from breakers set at say 1.5 inch, than on a pulp discharged from a 3-mash screen, and probably four times the efficiency on the coarse feed cited, than on ordinary middlings or tailings. Imagining for the moment all other things, such as speed of runners, their weight and shape, the screen in use, the form of pan, and the height of discharge, to be all correctly combined for the best results; the critical limit we are discussing in the instance of the two mills referred to above, lies according to the available evidence, more on the side of the higher, than of the lower speed mill, for the reason largely that the finer material interferes with the action of the runners, directly, in the grinding process and indirectly, in reducing the agitation in the pan, and, therefore, lessening the chances of quick discharge, for which reason the work put into the runners secures an inadequate corresponding result in tons of output.

The percentage of pulp that will pass through the finest mesh in use in any given plant, is generally taken to be the criterion of the relative efficiencies of the machines in use. Whilst this is a very useful approximate guide to efficiencies, it does not give any credit for the work represented by the reduction of the ore to finenesses above the minimum as in some cases there may be very little work left in the plus 200 pulp, to reduce it to the grade necessary to pass a 200-mash. This may be illustrated by reference to the gradings of the two mills in question. In the analysis of the gradings of the discharge of No. 2 mill, 36.94 per cent. of the pulp, remained on a 100-mash screen. The units of energy represented by this percentage are 7.97, and to grind it fine enough to pass 100-mesh would only need the expenditure of 1.26 additional energy units. In other words, although the gradings of Nos. 1 and 2 mills show approximately 20 per cent. more pulp through 100-mash from the former, the comparison of the energy units represented by the respective pulps, shows that the No. 2 mill has only just missed the realization of an equal number of energy units, as the No. 1 mill, and since it has treated 62 per cent. more tonnage, its tonnage energy units are vastly greater than those of the No. 1 mill.

If we had the problem of providing 16 tons of minus 100 material each day and the choice of the No. 1 slow speed mill, with its apparently better output of fine product; or the No. 2 mill, which would we choose?

With the No. 1 mill we could only treat 16 tons of ore all told, of which 13.23 tons would pass 100-mash, leavinfi 2.77 tons which would have to be stored for subsequent treatment. In the course of six days, the plus 100 pulp would have accumulated to say 16 tons, or one day's run of the mill working on coarse ore. The capacity of the mill, however, on the stored pulp, of which practically all passes 30-mash, and 85 per cent. passes 100-mesh screen, would be very different to that secured, when crushing the mixed grindings of the original feed from the breakers, a fact which is not sufficiently realized.

To illustrate this difference, let us calculate the respective efficiencies of the Evans-Waddell Chilian mills, grinding fine material at the Guerrero mill, Pachuca, from the figures supplied by Mr. Sherod in his paper to this Institution; and the figures given by Mr. Eaton of an Akron high speed Chilian mill, running on ore discharged from a stamp battery, fitted with 1.25-inch screens. As these mills are both of the high speed type, and very similar in construction, they give an excellent basis for comparison. Mr. Sherod in his tests, apparently only varied the feed to the mills, leaving all other conditions unchanged. For our purpose we will take the highest and lowest rate of feed used in his tests. The gradings of these No. 1 and No. 5 tests respectively, can be seen by reference to Mr. Sherod's paper. The relative mechanical efficiencies work out as under:

No. 1 Test. Feed 24 Kgs. dry ore per minute. Mechanical efficiency, 8.10 per cent.

No. 5 Test. Feed 70 Kgs. dry ore per minute. Mechanical efficiency, 17.00 per cent.

Or an increase of 110 per cent. in efficiency for the higher feed.

The foregoing result is roughly checked by taking as the standard of efficiency the Kgs. of ore ground to pass 200-mesh per h.p. per minute, as under:

Test No. 1 through 200-mash per h.p. per min. 0.19 Ggs.
Test No. 2 through 200-mash per h.p. per min. 0.42 Kgs.

Or an increase of 121 per cent. for No. 5 test.

The figures given by Mr. Eaton represent the average of one year's regular milling work on Rhodesian gold ore with high speed Chilian mill. The daily tonnage dealt with by the Chilian mill was 118.48, and the average power consumed 25 h.p. running 43 revs. per minute.

The average gradings of the feed were as follows:

On 1.25-inch mash	10.37%
On 0.75-inch mesh	16.25
On 8-mesh	29.30
On 20-mash	20.71
On 30-mash	5.10
Through 30-mesh	18.27

The analyses of the Chilian mill discharge, using 30-mash screen were as under:

	New die ring.	Worn die ring.
On 40-mash	1.50%	3.45%
On 60-mesh	13.50	12.26
On 90-mash	21.00	35.35
On 150-mash	15.20	10.45
150-mesh	48.80	38.40

The cost per ton for shells and dies, screens and all spares was 13 cvs. Mex. per ton. Chrome steel spares costing 24 cvs. per lb.

The average mechanical efficiency, worked out from the two analyses given is 60 per cent. The quantity ground through 150-mash per day was 57.8 tons, which is equal to 3.2 lbs. per h.p. per minute.

Referring now to our choice of the No. 1 or the No. 2 mill for the grinding of 16 tons per day, through 200-mesh. It will be realized from the comparative statements given above, how seriously the efficiency of No. 1 mill would fall, when put to work on material of which 85 per cent. passes 100-mesh. It is extremely probable that it would fall, from its normal 57 per cent on the coarse feed, to under 10 per cent on the fine material. Therefore, in order to grind the whole of the stored material fine enough to pass a 200-mesh, we would either have to return the oversize as it is made, and thus reduce the capacity of the machine, or would have to use up several days grinding the stored material to pass 200-mesh, during which time we would be running all behind on the daily tonnage required.

The No. 2 mill, on the other hand, has a daily capacity of 26 tons, due to its faster speed, and of this 16 tons passes through 200-mesh. The plus 200 pulp, would be continuously returned to the mill, mixed with the coarse feed, and subjected to reduction in the mill, under the most favourable conditions, and would be reground to pass 200-mesh proportionately to its percentage of the total mill feed. Of the two machines we would unquestionably, therefore, choose the No. 2 higher speed mill.

The lengthy digression in the preceding paragraphs, has arisen from a desire to illustrate by examples from practice, that not only is there no apparent advantage in the slow speed mill, but that there are serious economic disadvantages when the mill is used intentionally for fine grinding, inasmuch as the working results from Chilian mill practice definitely point to the superiority of the higher speed mill, a fact which as before pointed out, was fully recognized by Mr. Bayldon.

In order to form any adequate conception of the respective merits of Chilian mills versus stamps and tube mills in combination, it is necessary, I think, to examine much farther into the subject than Mr. Empson has gone. I propose, therefore, to contribute my quota to that further enquiry, trusting to other members to do likewise.

If we compare Chilian mills to stamps, it must be clearly defined on what basis the comparison is made. The modern stamp mill has been relegated to a place which is more efficiently and legitimately filled by machines of other types, e.g., breakers and rolls. It is now essentially regarded as a machine for fine breaking, as distinct from grinding.

The form of the Chilian mill is such, that as a purely ore breaking machine it cannot compete with breakers in their own province, nor with the heavy stamp when it invades the province of the breaker, if for no other reason, because of the difficulty of clearing the broken ore. Its value consists in the fact that it combines in one machine, a breaking and crushing action, which is tantamount to the functions performed by the stamp-tube mill in combination. The field for comparison is, therefore, to be found on the finished products preparatory to cyanidation.

Mr. Empson says: "Much can be written in favour of stamps as applied to ores which do not call for reduction to slime, but on which leaching of sand is possible; under these conditions where ore is to be crushed to quarter-inch mesh in stamps, and reduced to 30 to 40-mesh in tube mills, the slow speed Chilian does not compete."

This statement cannot, I think, convey what Mr. Empson means that it should. To begin with, a 1,500-lb. stamp crushing very hard and silicious ores, through a quarter-mesh screen, would produce a pulp containing about 60 per cent. of material which would pass a 30-mesh screen, and if this were run to a tube mill working at very high tonnage capacity, the product would nearly all pass a 60-mesh screen. It would be infinitely better to throw out the tube mills, and put finer mesh screen on the stamps, if the pulp were only required of a fineness of 30 to 40-mesh, as the stamp mill would do that work at about say 30 to 40 per cent. efficiency, against the tube mill working at say 15 per cent. Apart from that, however, I know of no tube mill work designed to produce a pulp that will only pass 30 or 40-cash screen, nor do I know of any cyaniding ores which would give a high rate of extraction on such a coarse product.

In the paragraph following that from which I have just quoted, Mr. Empson estimates that a 1,250-lb. stamp, when crushing 10 tons per day (he does not say through what mesh screen) will only make 0.10 of a ton slime. I would estimate the slime from such a stamp as at least 0.30 of a ton per day. It has been proved by test with 1,900-lb. stamps crushing Rand ore through a screen with a width of aperture of 0.205 in., and length of aperture of 0.536 in., that between 20 and 25 per cent. of the pulp passes a 200-mesh screen. Undoubtedly a small percentage of the fines in both cases, is contained in the ore when it is delivered to the mill, so that the sliming is not all to the credit of the stamps, but failing a preliminary separation of the slimes, it must be taken as a credit. Seeing that the slime would be so much greater than Mr. Empson has calculated, I cannot agree with the tonnage he gives to the tube mills, as in practice it would be much less, and for this reason, the value of the comparison made with Chilian mills is greatly prejudiced.

I regret that I have no complete figures from Mexican practice, of stamp-tube mill combination for comparison with those submitted above, I have, however, gradings of both stamp mills and tube mills separately, obtained from Mexican practice, from which indications may be obtained.

The efficiency of Mexican stamp milling practice appears to be between 40 and 50 per cent., but the tube mill efficiency, from the figures at my command, does not exceed an average of 5 per cent. The indications are, therefore, that the combined efficiency of the plant would not seriously challenge the U. S. instance quoted above.

The relative mechanical efficiency of the slow speed mills, of the Pachuca type, quoted by Mr. Empson from "Urbiter," are not confirmed by other available information relating to similar mills running in the Pachuca district. The particulars are as under:

	Feed.		Discharge.	
	"A"	"B"	"A"	"B"
On 1.00 in.		30.57		
.75 in.	22.00	8.52		
.50 in.	17.00	15.50		
.25 in.	21.00	15.35		
6 mesh	9.00			
8 mesh		10.50		3.42
12 mesh	13.00	4.35		1.82
20 mesh	6.00	6.20		5.50
30 mesh		3.15		5.57
40 mesh	8.00		13.50	
50 mesh		2.30		7.92
60 mesh	0.40		7.00	
80 mesh	1.30		16.00	13.00
100 mesh	0.30		2.50	3.37
120 mesh		1.02		13.77
150 mesh	0.50		15.00	4.50
200 mesh	0.30	0.50	7.00	3.25
—200 mesh	1.20	1.07	39.00	32.50

"A" mill grinds 18 tons per day, and absorbs 11 h.p. 12 revs. per min. 15 screen.

"B" mill grinds 22.5 tons per day, and absorbs 17 h.p. 15 revs. per min. The screen is made of round bars spaced horizontally at 1.5 inch centres.

The feed to both mills is the regular ore of the Pachuca camp.

It will be noticed that I have omitted the fast speed Chilian mill quoted by Mr. Empson. On referring to Urbiter's paper I found that the figures given are the result of crushing in a combination of rolls and Chilian mills, and, therefore, they can only be used for representing such a combination.

There are very large differences, it will be seen, in the table above in the efficiencies of the mills I have worked out, and those which Mr. Empson uses in support of his conclusions regarding the high efficiencies of slow speed mills. I have no explanation to offer of the differences. Mr. Empson, in his reply to this discussion, may be able to reconcile them.

The data I have on the performance of high speed Chilian mills running on coarse feeds are not suitable, in the main, for the purposes of close comparison. The indications from the analysis, and a combination of the available particulars, show that these mills have an efficiency of from 50 to 70 per cent. on coarse feeds, and up to 3 lbs. per h.p. per minute of 200 material in the pulp discharged.

For the performance of these high speed mills on fine feeds the paper read by Mr. Sherod before this Institution, to which I have already referred, supplies a great deal of interesting information.

Returning now to the comparative efficiencies of the stamp tube mill combination, versus the Chilian mill, it is seen that on coarse feed the Chilian mill finished product shows a far higher mechanical efficiency for that mill, than does the product of a stamp tube mill combination show for the combination.

In addition to this advantage, the Chilian mill plant for equivalent output of fine material, when compared with the stamp tube mill combination would cost less than the stamps alone.

The comparative cost of running a stamp tube mill combination as against that of Chilian mills, is altogether in favour of the latter.

Indeed the cost for maintenance is considerably below that of the stamps, exclusive of the tube mills. The following costs, given by Mr. Hutchinson as those at the Goldfield Consolidated mill in Nevada, for stamps, tube mills, and Chilian mills, are especially interesting, because all three forms of mill are working in the same plant simultaneously.

	Labor per ton cents U.S.	Supplies repairs upkeep per ton cents U.S.	Power per ton cents U.S.	Total cost per ton cents U.S.	[illegible] time lost owing to machine
Stamps, crushing through 4 mesh	3.9	1.1	5.4	13.40	0.46
Tube mills......	1.4	6.5	8.7	16.60	
Chillian mills on fine feed.....	1.8	4.1	4.7	10.60	0.17

With regard to the design of mill submitted for criticism and suggestion by Mr. Empson, I have the following remarks to make, prefacing them by saying that although in his design, there are unquestionably many features of improvement over the mills of the Pachuca type now extant, in none do I find any improvements over many good types of fast running Chilian mills on the market. Briefly, my criticisms and suggestions are as under:

1. The centrifugal tendency of such massive runners as are proposed for this mill, should be utilized by trunnioning them below the centre of the axle.

2. In order to take full advantage of the pivotal action in runners of such width, the face of the runner should be divided into two separate discs, the one on the inner, and the other on the outer side of the runner face, leaving a central space of perhaps one-third of the face out of contact with the die. Thus the pressure per square inch on the grinding surfaces would be greatly increased, and on those portions of the face which through their backward and forward sliding movements, are the real grinding sections of the face. In consequence the grinding efficiency of the machine would be improved very considerably.

3. The thrust which the Mantsey offset will give to the runner, should be provided for by thrust rings turned on the axles. There is nothing to show that the angle of offset proposed, for the mill, is the critical one for the speed. If it is not, it will result in great friction, and wear for which there will be no compensation.

4. The shape of the pan, in my opinion, can be improved upon. The runners, to do efficient grinding and discharging, should work in as narrow and vertical a pan, as is practicable with clearance, and such a pan should be provided, and fitted with screens both on the inner and outer periphery.

5. Portion of the pan should be made to open out for the easy removal of runners.

6. The main driving boss should be made adjustable vertically, otherwise as the rings and dies wear, the output of the machine will be seriously reduced.

7. An arrangement should be provided fitted to the driving arms, for carrying weights for compensating for the weight lost by the runners as they wear, thus keeping the machine up to maximum crushing capacity all the time.

8. A light housing, at least axle high would be advantageous.

9. A three runner machine, instead of two, and a speed of 20 to 25 revs. would in my opinion greatly improve the capacity and efficiency of the mill.

10. Firm foundations are of the utmost importance for any grinding machinery. This mill should be set upon a block of reinforced concrete, to get the maximum effect.

If my written argument in this discussion conveys my meaning, it will be understood that I entirely support Mr. Empson in principle, on his advocacy of the excellent qualities of the Chilian mill, but I differ from his view, that the slow speed mill is the one especially adapted to the requirements of Mexican practice, for the reasons I have advanced.

In the course of the discussion arising out of Mr Empson's advocacy I have the hope that a supporter of the Ball mill will appear, a machine which is dry crushing an average of 63,000 tons per month on the Kalgoorlie goldfield.

Also the interest of someone may be aroused who will oppose the use of the tube mill, with the natural adjunct of the Chilian mill, namely, the grinding pan.

TECHNICAL LITERATURE

The Effect of Explosives Used in Mining.—Writing in the Colliery Guardian on the harmful effects of explosives upon coal miners Sir Thomas Oliver is disposed to attribute these rather to carbon monoxide and not to nitrogen oxides. In the United States the subject has been studied by Dr. Thomas Darlington, whose experience is based upon 1,700 cases of partial asphyxia, and of poisoning caused by explosions of dynamite during the construction of the new Croton Aqueduct, New York. There are two types of poisoning, the acute and the chronic. When only a small amount of dynamite has exploded, or where the workman have been immediately removed to the fresh air by their comrades, the trembling, flushing, or pallor of the face, nausea, vomiting, throbing of the temples, rapid heart beat and sense of fulness of the head, usually disappear within 24 hours. Even where the workmen have been brought in contact with large quantities of the products, and have become giddy, unconscious, and asphyxiated, the coma usually passes away, and most of the patients recover. In some instances, however, death has come from respiratory failure. The symptoms are considered by Darlington to be due to volatilization of nitro-gycerne, but there is equally a close and similar resemblance between poisoning by carbon monoxide and nitroglycerine.

The Illumination of the Coal Mine.—Commenting editorially on ex-papers recently read by Drs. J. S. Haldane and T. L. Llewellyn at the annual meeting of the South Staffordshire and Warwickshire Institute of Mining Engineers, describing experiments conducted by the authors to determine the effect of the composition of the mine air upon the amount of light which a safety lamp is capable of giving, the Colliery Guardian remarks that the diminuation of oxygen in mine air can take place in several ways. An addition of 1 per cent. of moisture diminishes the true oxygen percentage in pure air by 021. Thus as the percentage of moisture increases, the illuminating power of the lamp diminishes. The effect of moisture on the light given by a safety lamp has not apparently been previously investigated experimentally, although its effect upon protometric determinations is known. Thus it has been found that for every increase of 1 per cent. in the moisture percentage of the air the illumination of the standard pentane lamp and also of the Hefner amyl-acetate lamp falls off by 5 per cent. The effect would probably be not less in the case of an ordinary safety lamp, and certainly the experiments of Messrs. Haldane and Llewellyn bear this out, since the variation in moisture content in mine air is as much as, and often greater than, was the case in the experimental chamber employed by them. As regards the influence of carbon dioxide, the authors call attention to the confusion that has arisen through attributing to this gas the premier role in producing dimness of illumination. In their view it is only the variation in true oxygen percentage that matters in a practical sense, and how this percentage is diminished is of small importance, although it is true that added carbon dioxide does produce rather more effect than added nitrogen.

Mineral Resources of the Kenai Peninsula.—Mr. W. M. Brewer contributes a short descriptive article to the Mining and Scientific Press, of November 23rd, on this gold-bearing area, north of Seward, in Alaska. Placer gold was discovered along the south shore of Turnagain Arm as early as 1896, but it was not until 1905 that quartz discoveries were made. The country rock throughout the area is slate and greywacke, with many intrusive dikes, composed of a much altered quartzose material which so far has not been classified. The ore occurs in fissures, many of which have their lines of strike crossing the bedding planes of the country rock nearly at right angles. The fissures are apparently deep seated. Other instances occur where the fissures cross the bedding planes of the country rock nearly at various angles, from 10 to 30 or 40 degrees, and, in some cases, the orebodies occur lying conformably with the stratification of the slates, resembling gash veins. The values appear to be exceptionally high, the ore milled to date having yielded from \$50 to \$60 to the ton. Mr. Brewer is apparently very favourably impressed with the possibilities in this field.

The Nature of Metasomatism or Mineral Replacement.—Mr. Waldemar Lindgren contributes an article on this subject to the last issue of Economic Geology. His conclusions are as follows: The transformation of one mineral into another of different chemical composition, effected by practically simultaneous solution and precipitation, is called replacement or metasomatism. It is necessary to distinguish between (1) ret actions in open space, where no restraining influences oppose a change of volume or where the force of crystallization can easily overcome the restraining pressure, and (2) reacitons in rigid rocks where the new mineral is forced to make room for itself by solution of the host mineral; in this case the volume of the replacing mineral equals that of the mineral replaced; the force of crystallization is of little or no direct influence, but the pressure exerted probably promotes solution. The chemical equations written to express such replaoements are of little value, because they give relations by weight instead of relations by volume. Such replacements proceeds independently of molecular weight, molecular volume, and specific gravity. It does not take place "molecule for molecule," nor by a given proportion between the molesules dissolved and precipitated. At the same time it is molecular, or, at least, sub-microscopic in the sense that complex chemical reactions constantly take place in the contact films of solutions; the process goes on in one operation, solution and precipitation following so closely that no spaces of solution are visible under the microscope. Structure and texture are often faithfully preserved. If replacement proceeds from an extremely large number of points in a mineral, with the development of fine-grained substance, increased porosity may result from the aggregate of minute solution ducts. Replacement by equal volume takes place in most perfect form when the rock is permeated by stagnant or slowly moving solutions. Re placements in mineral deposits are sometimes caused by raipdly moving solutions and then the equilibrium may be disturbed; solution may be more active than deposition; drusy structures may then result by local deficiency of the solutions in the substances precipitated.

Mr. Alfred C. Garde, formerly of Nelson, B.C., has, in partnership with Mr. W. J. Kennaugh, established himself in consulting practice at Prince Rupert. The firm will be known as Garde & Kennaugh, civil and mining engineers.

BRIEF REVIEW OF MINING IN BRITISH COLUMBIA

In responding for British Columbia at the opening session of the American Mining Congress, held in Spokane, Washington, on November 25-29, Mr. E. Jacobs, of Victoria, B.C., Secretary of the Western Branch of the Canadian Mining Institute, after having first expressed appreciation of the cordial welcome extended to British Columbians present, said:

"Of the 382,000 square miles of territory in British Columbia, approximately 300,000 square miles is known to be extensively mineralized, and to-day most of this remains a virgin field for the prospector and the investor in undeveloped prospects.

"British Columbia is a part of the great Cordilleran belt which, in South America, Mexico, and the western United States, is recognized as one of the greatest mining regions of the world, noted principally for its wealth in gold, silver, copper, and lead—unparalleled for continuity, extent, and variety of its mineral resources. In Canada and Alaska this belt maintains its reputation, though for the greater part unprospected. In Canada, where it also has enormous resources of coal of excellent quality, it has a length of 1,300 and a width of 400 miles. It is pre-eminently a great mining region.

"Ten years ago Mr. Bernard MacDonald, for several years managing mines at Rossland, B.C., read before the Canadian iMning Institute a paper on 'Mining Possibilities of the Canadian Rockies,' and in that he showed that in Mexico the Rocky mountains had yielded of the previous metals alone a production of $5,500,000,000 over a length of 1,700 miles, or an average of $3,124,857 a mile; in the United States, $4,500,000,000, or $3,461,538 a mile along a length of 1,300 miles; while in Canada the total had reached only $166,000,000, or $103,759 a mile for 1,700 miles. Later, Mr. MacDonald remarked: 'It is fair to assume that the Rockies in Canada will yield a quantity of the precious metals equal to that produced by them in American or Mexican territory—mile for mile of their length—when equally developed.' (The value of gold and silver produced in British Columbia in nine years since Mr. MacDonald spoke is about $60,000,000.) It should be noted that much of the Cordilleran belt in Canada is in British Columbia.

"Let me add, in passing, that the area and probable coal content of the coalfields of western Canada have been placed by Mr. D. B. Dowling, of Geological Survey of Canada, at 37,000 square miles and 169,000 million tons of coal (or 97 per cent. of that of the whole of Canada), as against 432 square miles, and only 5,212 million tons for Nova Scotia and New Brunswick, which provinces have long been the chief producers of coal in Canada. The estimate for British Columbia is 1,351 square miles, and 40,225 million tons of mineable coal.

HISTORICAL.

"The first known discovery of mineral in British Columbia was made on Kootenay lake in 1825 by Mr. David Douglas, a Scottish botanist, who was investigating the flora and fauna of that district. Later, Hudson Bay Co. trappers made bullets from the lead ore outcropping there, and in 1864, Mr. George Heart, of California, took in a small open-hearth furnace and smelted some ore, but the low grade of the bullion, the long distance from market, ad the absence of transportation facilities discouraged him, so that he abandoned it. Late in the eighties, Dr. W. A. Hendryx and associates from Minnesota and Connecticut, who had been on Kootenay lake for sport, became interested in and acquired the property, afterward erecting a lead smeltery in the neighborhood, but they, too, gave up the venture as unprofitable. To-day a New England man Mr. S. S. Fowler, a Columbia University graduate, is operating the Blue Bell mine, as it is now called, for a French company—the New Canadian Metal Co., Ltd.

"Coal was first discovered in British Columbia in 1835, by Hudson Bay Company officials, at Fort Rupert, Vancouver island. In 1851 coal-mining operations were commenced at Nanaimo, also on that island, and, later, the chief market was found for the product in San Francisco, where much of it still goes. The Nanaimo mines are now owned by the Western Fuel Company, a San Francisco proprietary. Up to date, more than 22,000,000 long tons of coal has been produced by Vancouver island coal mines.

"In 1858 gold was found on Thompson and Fraser rivers, and in 1860-1861 the enormously rich placer-gold fields of Cariboo were opened. It is an old story how people hurried from San Francisco in thousands; how they crossed the Isthmus of Panama, or rounded Cape Horn, or plodded wearily overland from Canada and the United States. Haid the historian: 'Victoria became a city in a day, and the Mainland solitude was converted into a Crown colony in a year.' Since then those fieldfields have yielded about $50,000,000, and are still being worked profitably.

"In the late eighties the production of lode metals—silver and lead—was commenced; in 1893 gold was added, and the next following year copper was produced.

MINERAL PRODUCTION.

"The aggregate value of all minerals produced in British Columbia to the end of 1911 is on official record as $397,696,000, of which approximately $72,000,000 is for placer gold, $65,000,000 lode gold (toal gold, $137,000,000), $32,000,000 silver, $26,000,000 lead, $65,000,000 copper, $122,000,000 coal and coke, and $15,000,000 miscellaneous minerals.

"The aggregate value of the mineral production of all Canada for 36 years, to 1911, inclusive, is $1,235,525,000. Of this total, British Columbia's proportion is about $333,696,000, or between 26 and 27 per cent. It is a striking fact, indicating the great increase in recent years, that 37 per cent. of British Columbia's production was made in the last five years, while more than half—51 per cent.—was that of seven years, 1905-1911.

"A word or two as to individual properties. The Granby Co. has mined and smelted to date more than ,8000,000 tons of copper ore, from which was produced about 192,000,000 lbs. of copper, 3,000,000 ozs. of silver, leaving net earnings of $7,400,000, of which last about one-half has been distributed in dividends. To-day the company has, in its mines in Boundary district, between 6,000;000 and 7,000,000 tons of ore 'estimated in sight.' Its copper smeltery at Grand Forks is stated to be the largest in the British Empire. In 1910—later years were broken years—it mined and smelted 1,178,000 tons of ore at a cost, including converting of copper, but not marketing, of $2.50 a ton. To-day its smelting and converting costs (not mining) are about $1.20 a ton of ore. All Boundary district mines have together produced about $60,000,000 worth of ore, gross value.

"Rossland camp's production has totalled about $[illegible],000,000. The Consolidated Mining and Smelting Company's Rossland mines have produced 3,376,000 tons of ore, with a gross value of $45,000,000, this including 1,624,000 ozs. of gold. The company's St. Eugene mine, in East Kootenay, has produced 1,015,000 tons of ore, which contained 5,319,000 ozs. of silver and [illegible] lbs. of lead, having together a gross value of $10,526,000. The company's smeltery at Trail has treated 3,144,000 tons of ore and concentrate, having a gross value of $52,167,000. The Betts electrolytic process for refining lead was first used on a commercial scale at Trail, under the direction of Mr. Jules Labarthe, one of the delegates here to-day from Nevada.

"In conclusion let me briefly refer to the mining laws of British Columbia. I have here a Government pamphlet, which contains a synopsis of these. It is claimed for our mining laws that they are very liberal in their nature and compare favourably with those of any other part of the world. The 'Coal Mines Regulation Act' is considered about the best in force in the British Empire—perhaps in the world. Sir Richard McBride, Premier and Minister of Mines for British Columbia, when addressing the Canadian Mining Institute a few weeks ago, said: 'We do not say that this legislation is perfect and stands for the last word in the way of mining regulation, but we do claim that it is an immeasureable advance on any legislation in a similar direction heretofore attempted in any of the provinces of Canada, and has well proved the wisdom of having it placed on the Statute books of the province.' And, what is of equal importance, the mining laws of British Columbia are enforced."

UNITED STATES DUTIES ON LEAD AND ZINC.

The following is a copy of one of the resolution passed at the meeting of the American Mining Congress, held in Spokane, Washington, last month. As it is one that affects particularly the Kootenay district of British Columbia, it will probably be of interest to Western Canada readers of the Canadian Minin Journal:

"Whereas the lead and zinc mining industries of the United States constitute a great productive industry, employing many thousands of men, and this development, in turn, has created many other industrial enterprises of vast importance to the country at large, and

"Whereas the existing tarig duties on lead and zinc ores have been demonstrated to be less than the actual difference between the cost of production here and in competing countries, and

"Whereas any reduction of the present rates of duty would result in the closing down of many mines that are now being profitably operated, thereby depressing industry, destroying values, and throwing labour out of employment and would also discourage prospecting and retard the development of the mineral resources of the country, and

"Whereas the duties now levied upon the imported lead and zinc ores are fully justified as revenue-producing measures, and

"Whereas the lead ore in the smelting of refractory gold ores in the gold-producing states is an absolute essential, and any burden placed upon the lead industry will increase the cost of gold production, and

"Whereas the prevailing high level of production costs, including wages, mining machinery, and mining supplies is gradually increasing, while the value of gold remains stationary, and in consequence of which the production of gold from low-grade refractory ores is being greatly hampered, and

"Whereas neighbouring countries, where the cost of labour, machinery, and supplies is very much less than in the United States, are able to produce lead ores at so much less cost as to enable them to displace the use of domestic lead ores in the markets of the United States, and thereby making impossible the production of those lead ores essential to the smelting of gold ore, which, in turn, will have the necessary effect of greatly restricting the production of gold in the United States;

"Now, therefore, be it resolved: That the American Mining Congress believes that the best interests of the nation demand that the tariff on lead be not reduced, because any such reduction would diminish the production of gold, which is the basis money of this country.

"Resolved, further: That the American Mining Congress re-affirms its prior declarations favouring the retention of the present tariff duties on lead and zinc ores, and pledges its egorts to prevent any reduction thereof."

THE SAND FILLING OF STOPES.

Since the sand filling of stopes was commenced on the Witwatersrand the number of mines that have adopted this method of supporting excavations has gradually increased. Several of the largest mines on the Rand have installed plants for this purpose and others are now doing so. It is stated that no serious difficulty has been experienced in neutralizing the egect of cyanide compounds remaining in current sand. Permanganate of potash, bleaching powder or similar oxidizing agents are used to convert the dangerous salts into stable syanates, and care is taken that only neutral or alkaline water is used for flushing the sand. Many forms of pipe lining have been tried, according to the report for 1911 of the Rand Inspector of Mines, but, unfortunately, not one of them will withstand the friction of the sand in a long vertical column. Present practice points to three methods of surmounting the difficulty of excessive wear in deep vertical shafts: (a) The pipe can be broken at intervals of about 300 feet and the velocity of flow checked by baffle boxes; (b) the sand can be dropped down dry through a wooden box launder about 6 inch square section and picked up with water near the bottom of the shaft; (c) a borehole can be sunk to connect into a stope and from the bottom of it pipes or launders can be used to convey the pulp. All these processes are at present under trial. The difficulties of retaining the sand underground have been largely overcome, strong timber or waste packs faced with cement being used as barricades.

Where the process has been entered upon on a large scale the results are stated to have been very satisfactory. At the Witwatersrand Deep, for instance, a large section of the upper works has been filled and a considerable amount of valuable ore in the shape of pillars has been recovered. It is found even in the steepest workings that if the sands on being deposited are carefully drained the lower deposit quickly dries out and very little weight is thrown on the supporting barriers or stulls, which need not be nearly so strong as might be imagined if the proper conditions of draining are observed. At the same time good ventilation is provided around the free sides of these barriers and regular inspections are carried out to prevent the possibility of a breakaway. At the same mine current sands are used for filling. They are flushed from the tanks, and after being treated with permanganate of potassium to free

them of any contained cyanide, are run down to an old winze at the top of which they are dewatered in cones, the water being pumped back and the resulting sludge being led down to the workings in pipes and launders. It is hoped that all the current sands may eventually be disposed of in this manner, which, on the other hand, will result in a great saving of labour. At the Cinderella Consolidated a long series of experiments have been carried out. At first the ordinary method of taking the wet sands down in pipes was tried, with both ordinary iron pipes and wood-lined pipes. It was found, however, that a great amount of scouring took place and the pipes were continually bursting, flooding the shaft with sands and causing endless trouble and delay, so that method had to be ultimately abandoned. A wooden box was then carried down the shaft, 12 inches square in section, with bap doors about every 100 feet. Experiments were then carried out over a long period with dry and damp sands. It was eventually found that a dry sand, containing not more than 5 per cent. of moisture, could be successfully passed through, a bucket full of stones being emptied down every half-hour to clear any tendency to clog. If more than 5 per cent. moisture is present in the sands it is found that clogging takes place in the box and operations have to be stopped and the box cleared. These facts, at any rate, make it clear, the "South African Mining Journal" remarks, that the difficulties in the way of successful sand filling are being overcome.

PERSONAL AND GENERAL

Mr. Alexander Hamfield, who for the part three years has been associated with the iron mining industry of the Mesabi district, Minn., is visiting Montreal. Mr. Hamfield was for many years a resident of British Columbia and mined in the Cassiar district.

Mr. L. K. Armstrong, secretary of the Spokane local section of the American Institute of Mining Engineers, has proposed that the Western Branch of the Canadian Mining Institute and the Spokane local section of the A. I. M. E. hold a joint meeting in Kootenay district, B.C., next spring. The proposal is likely to prove acceptable to all parties concerned, and it is probable arrangements will be made to hold a joint meeting at Rossland about the middle of next May.

The story sent out from Vancouver, B.C., as a press despatch, to the effect that Mr. James Breen, a well-known metallurgist, who built the Northport smeltery, Washington, which was afterward sold to the Le Roi Mining Company, and the smeltery at Crofton, Vancouver Island, had died lately in Anaconda, Montana, has been denied in Spokane, Washington, which city, it is stated, was recently visited by Mr. Breen when on a wedding tour.

Dr. D. W. Brunton, of Denver, Colorado, who has just succeeded Mr. Samuel A. Taylor as president of the American Mining Congress, has been visiting his son at Greenwood, Boundary district of British Columbia, where the latter (a McGill graduate) is assistant to the superintendent of the British Columbia Copper Company's smeltery. Dr. Brunton is a Canadian (of Brantford, Ontario), though for many years engaged in metallurgical and associated work in the United States. Among other prominent positions he has held is that of president of the American Institute of Mining Engineers (1909).

Prof. Joseph Daniels, of the College of Mining, University of Washington, Seattle, Washington, was among the Coast visitors to Spokane, attending the American Mining Congress.

Mr. E. P. Dudley, who several years ago was engaged at the Britannia mines, near Howe Sound, B.C., is now construction engineer for the Bunker Hill and Sullivan company at Kellogg, Idaho. He is a nephew of Colonel Dudley, well known as United States consul at Vancouver, B.C.

Mr. A. F Eastman, of Tacoma, Washington, manager of the Tacoma Steel Company's mining department, recently returned to the company's Marble Bay mine, near Van Anda, Texada Island, B.C., after having been detained two or three weeks at his home in Tacoma by sickness in his family.

Mr. Edward Fink and Mr. H. W. Seamon, both of Chicago, have been in the northwestern States in connection with interesting mining men in a lead-zinc reduction process that Mr. Fink has developed. At Spokane a number of mining men from British Columbia were shown plans of the plant and given a description of the process, which is described as being economical and effective.

Mr. R. H. Flaherty, on Messrs. Mackenzie and Mann's engineering staff, went west from Toronto late in November.

Mr. Albert I. Goodell, formerly manager of the Boundary Falls smeltery and afterwards of the Le Roi Mining Company's smelting works at Northport, Washington, was among those who welcomed the British Columbia visitors to Spokane during the meeting of the American Mining Congress.

Mr. Robert R. Hedley, of Vancouver, B.C., has been examining mining properties on one of the Queen Charlotte Islands.

Mr. E. J. Roberts, superintendent of the Corbin Coal and Coke Company, with a colliery in Southeast Kootenay and headquarters in Spokane, has returned from a holiday visit to the south.

Mr. F. A. Ross, formerly manager of the Nickel Plate gold mines and 40-stamp mill at Hedley, Similkameen, until these were sold by the executors of the Marcus Daly estate to the organizers of the Hedley Gold Mining Company, now operating them, is resident in Spokane.

Mr. R. B. Rathbun, chief electrician at the Granby Company's smelting works at Grand Forks, B.C., left that place late in November to visit the big smeltery at Garfield, Utah.

Mr. O. B. Smith, general superintendent of mines for the Granby Consolidated Company, and Mr. W. A. Williams, superintendent of the company's smelting works, have returned to Boundary district from the company's Hidden Creek mine, near Observatory Inlet, B.C. Together with Mr. F. M. Sylvester, assistant to the general manager, they are receiving and considering bids from manufacturers and others for mining and smelting plant

and machinery required for equipment of the Hidden Creek mines and the new smeltery and hydro-electric plant the company is preparing to put in at and near Granby Bay, a branch of Observatory Inlet. Mr. George W. Wooster, treasurer and director of the company, left Grand Forks for Granby Bay during November.

Mr. Thos. Wall, who is superintending the development of the [illegible] mine, situated in the mountains [illegible] of Kootenay Lake, recently returned to the mine from a visit to Nelson, B.C. With deep snow in the country in which the mine is situated, and little or no traffic to keep the trail open, communication with outside places is cut off during several of the winter months.

Mr. Frederick R. Weekes, of New York, who has been engaged throughout the year in connection with the exploration and development of two groups of mineral claims situated a few miles from Princeton, Similkameen, B.C., that the British Columbia Copper Company has under bond, recently spent several days with the company's manager at Greenwood. The directors of the company will shortly decide whether to make a considerable payment on the larger group, known as the Voight group, or relinguish their bond and option of purchase. Part of the purchase money on the smaller group was paid two or three months ago.

Prof. Francis A. Thomson, head of the mining engineering department, State College of Washington, late in November went to Victoria, B.C., on a private visit.

Among the large number of men, more or less directly connected with the mining and metallurgical industries, who attended the American Mining Congress at Spokane, Washington, during the last week in November, were between forty and fifty from British Columbia—chieby from Kootenay district—and several from other parts of Canada. Those from British Columbia included the following: Mr. W. M. Archibald, of Trail, one of the Consolidated Mining and Smelting Company's mining engineers; Mr. A. J. Becker, of New Denver, manager of the Apex and Sunset mines, Slocan; Mr. H. B. Brown, of Hedley, Similkameen; Mr. G. F. Caldwell, of Kaslo, manager of the Utica mine, Slocan; Mr. L. A. Campbell, M.L.A., of Rossland, general manager of the West Kootenay Power and Light Company; Mr. Lyman Carter, manager of the Blue Bird mine, Rossland; Mr. E. A. Cleveland, of Vancouver, interested in the Surf Inlet Gold Mines, Limited, operating on Princess Royal Island; Mr. C. S. Cradock, of Nelson, representing Sandon, Slocan; Mr. Graham Cruickshank, of Rossland, superintendent of the Le Roi concentrating experimental plant; Mr. E. R. Davidson, manager of the Eureka mine, near Whitewater; Mr. G. B. Dean, superintendent of the Silver Ridge mine, Three Forks, Slocan; Mr. W. S. Hawley, Spokane, representing the Silver Hoard mine, Ainsworth; Mr. P. F. Horton, manager of the H. B. mine, near Salmo, Nelson mining division; Mr. E. Jacobs, of Victoria, secretary of the Western Branch of the Canadian Mining Institute; Messrs. A. G. Ladson and R. S. Lennie, of Vancouver, and Mr. W. F. McClurg, of Sandon, all representing the Slocan Star Mines, Limited, Slocan; Mr. Frank E. Pearce, of Paulson, manager of the Inland Empire mine; Mr. M. E. Purcell, of Rossland, superintendent of the Centre Star group of mines; Mr. A. E. Rand, of New Westminster, owning large mining interests in Nelson mining division; Mr. J. Rogers, of the Crow's Nest Pass Coal Company, Fernie; Mr G. B. Webster, of New Denver; Mr. Bruce White, of the Noonday mine, near Cody, Slocan; Mr. W. C. H. Wilson, of the British Columbia Copper Company, Greenwood, Boundary district. Alberta was represented by Mr. John Brown, of Hillcrest; Mr. A. A. Millar, of Blairmore, and Mr. J. C. Reid, manager of the Chinook Coal Mining Company, Lethbridge. Mr. S. Gordon Smith registered as representing the Peninsula Mining Syndicate, Pontiac, Quebec. Others, who at one time or another have been connected with mining in British Columbia, met in Spokane by the writer of these notes, were: Mr. F. E. Cummins, who recently resigned as superintendent of the Surprise mine, Slocan; Mr. Stanley A. Easton, general manager of the Bunker Hill and Sullivan Company, with large mines and concentrating works at Kellogg, Idaho; Mr. George Watkin Evans, of Seattle, who spent last season in the Groundhog coal field, Northern Skeena district; Mr. J. Cleveland Haas, of Spokane, for years connected with mining in Boundary district; Mr. Robert Keffer, son of Mr. Frederic Keffer, acting general manager of the British Columbia Copper Company, Greenwood, Boundary district), who is now in his fourth year in mining engineering at the State College of Washington, Pullman; Mr. Jules Labarthe, formerly superintendent of the Consolidated Mining and Smelting Company's smelting works at Trail, now general manager of the Mason Valley Company, owning mines and a smeltery in Nevada; Mr. Douglas G. Livingston, formerly with the Tyee Copper Company, and now one of the professors in mining engineering, University of Idaho, Moscow, Idaho; Mr. Sidney Norman, of Spokane, in bygone years interested in mining property in Slocan district; Mr. J. V. Richards, of Spokane, who has been connected with Slocan mines; Mr. C. Rundberg, some time since superintendent of the Dominion Copper Company's mines at Phoenix, Boundary district; and others.

Mr. L. T. Rogers, late of Porcupine, has accepted a position at the Cordova mine, Eastern Ontario.

Mr. George F. McNaughton has returned to Toronto after spending several months at the St. Anthony mine in an advisory capacity.

Mr. J. W. Astley and Mr. A. B .Willmott are in New York giving evidence in the Hawthorne case.

Mr. Joseph C. Houston has accepted the position of manager of the Schumacher mine, Porcupine.

Mr. Robert Brice is in Toronto.

Mr. J. C. Murray gave an address on December 9th before the Political Science Club, Queen's University, Kingston, on "Mining and Promotion."

Mr. G. M. Colvocoresses has opened an office at 43 Exchange Place, New York.

Mr. R. J. Flaherty, who returned from Ungava some weeks ago, will remain in Port Arthur until after Christmas.

Colonel R. G. Edwards Leckie has returned to British Columbia.

Mr. W. Jacobsen, mining accountant, who has had long experience both in this country and in South Africa, has opened an office in the Confederation Life Building, Room 256, Toronto.

Hon. E. H. Armstrong, Minister of Mines from Nova Scotia, was in Toronto early in December.

Mr. W. F. Ferrier, of Toronto, and Mr. Theo. Denis, of Quebec, attended the meeting of Council of the Canadian Mining Institute, held in Montreal on the 5th inst. In the evening they were the guests of honour at a dinner given by the Montreal Branch.

Mr. Henry Hanson, of the Domes Mines, Porcupine, expects to spend the holidays in San Francisco and will leave for the West on or about the 15th of December.

Mr. J. M. Forbes, of Black Lake, Que., has returned from a visit to England.

Dr. J. F. Kemp has been retained to make a report on asbestos properties in the Eastern Townships.

Mr. John J. Penhale is engaged in a professional examination of the Jacobs asbestos mines.

Mr. Robert R. Hedley has opened an office in Vancouver, where he will engage in consulting work.

The Engineering and Mining Journal announces that Mr. Frederick K. Brunton has resigned from the testing department of the reduction works at Anaconda, Mont., to accept a position at Greenwood, B.C., as assistant superintendent of the British Columbia Copper Company's smelting works.

Mr. R. P. Cowen, of Montreal, has returned from Europe after an absence of some months.

Mr. M. J. Butler, formerly general manager of the Dominion Steel and Coal Corporation, leaves shortly on a visit to England.

Mr. W. Y. S. Ayres, consulting mining engineer, of Hazleton, Pa., who has been examining coal properties in Alberta for clients, passed through Montreal last week.

Mr. Robert Bryce, of Silverton, Col., recently visited the Cobalt district, where he was formerly manager of the Silver Queen mine.

A SYSTEM OF SAND-FILLING USED ON THE RAND*

By R. E. Sawyer, Associate.

The method of supplying dry sand to a shaft for filling purposes as here described is actually in operation, and, consequently, may be considered to have passed out of the experimental stage. It was the invention of Mr. Girdler-Brown, general manager of the Cinderella Consolidated mine, in the Transvaal, under whose direction the author installed and subsequently operated the plant. The system adopted renders the operation of sand filling at great depths, when, of course, it is most needed, a matter of comparative simplicity, though success was not achieved without considerable thought and much hard work, accompanied by many reverses. In first cost it compares favourably with any other method, no de-watering cones or neutralization process being necessary, and it shows to the greatest advantage when employed in shaft of great depth and in circumstances where continuous filling is not necessary, as interruptions are almost certain to occur from time to time in wet weather, due to an excess of moisture in the sand.

The sand used should not contain more than 5 per cent. to 6 per cent. of moisture, and should have been exposed to the sun and air for at least two days before use; it will then be practicaly free from cyanide and neutral in character. Sand in this condition may be found at the foot of any working dump during fairly dry weather. Sand taken direct from the cyanide tanks was tried, but even after it had been treated with potassium permanganate, considerable quantities of cyanogen were evolved when the sand became mixed with ordinary acid mine water. This action was, however, entirely obviated by exposing the sand to the sun and air, as already mentioned.

The plant was originally laid out with a view to adopting the usual practice in sand filling of running the sand down the shaft already mixed with water, but this idea was found to be impracticable, owing chiefly to the excessive wear of the pipes caused by the great depth through which the mixed sand fell, and the cost of pumping entailed.

When the column first installed was worn out, it was decided to replace this by a square wooden box launder down which the sand should fall unmixed with water. This launder measured 12 in. × 11 in. in cross section, inside measurement, and its cost was approximately 2s. 6d. per running foot. Observation doors were cut at distances of about 100 ft.

The piping and launder from the surface bins were replaced by a belt which conveyed the sand to the top of the box launder. It was found that sand containing no more than 4 per cent. of moisture would run freely from the bins to the belt without handling. On arriving at the head of the launder, the sand falls down the box on to a steeply-inclined iron plate on which a stream of water is made to play. The plate, by the way, should be provided with a liner of the hardest white cast iron to counteract the excessive wear at that point. On being mixed, the sand and water flow into a steeply inclined launder where they undergo further mixture before being conveyed by means of pipes or other launders to the part of the mine requiring treatment. The effective capacity of the plant is controlled by the quantity of water available, as it is found that the delivery of the sand through the vertical box is practically without limit. In the plant now installed, experience shows that the box launder has not appreciably worn, a reason for this being the conduct of the sand, which travels normally down the centre of the box, with little or no impingement on the side. This was proved by examination through the observation doors already alluded to; the sand could be seen falling in a steady stream; the bare hand could be held in the corners of the box, but it was difficult to hold an iron bar across the falling sand in the middle of the launder, and the metal was quickly polished by the rapidly-moving particles. It was noticed that the falling stream of sand created a suction of air down the launder; thus, on opening an observation door no sand escaped, but air was drawn in.

From time to time trouble was caused by the sand containing too great a percentage of moisture. This caused it to adhere to the sides of the launder in gradually increasing quantities until at last the flow was seriously impeded. Under such circumstances, the remedy was to sluice out the box with water from the surface until the adhering sand was washed away. In this connection, experiments were conducted with a view to determining the maximum percentage of moisture which would allow of the sand being run down "dry." The following were the results obtained:

From 0 to 5 per cent. of moisture allowed the sand to fall freely, leaving the sides of the box clear and dry.

*Paper read before the Institution of Mining and Metallurgy.

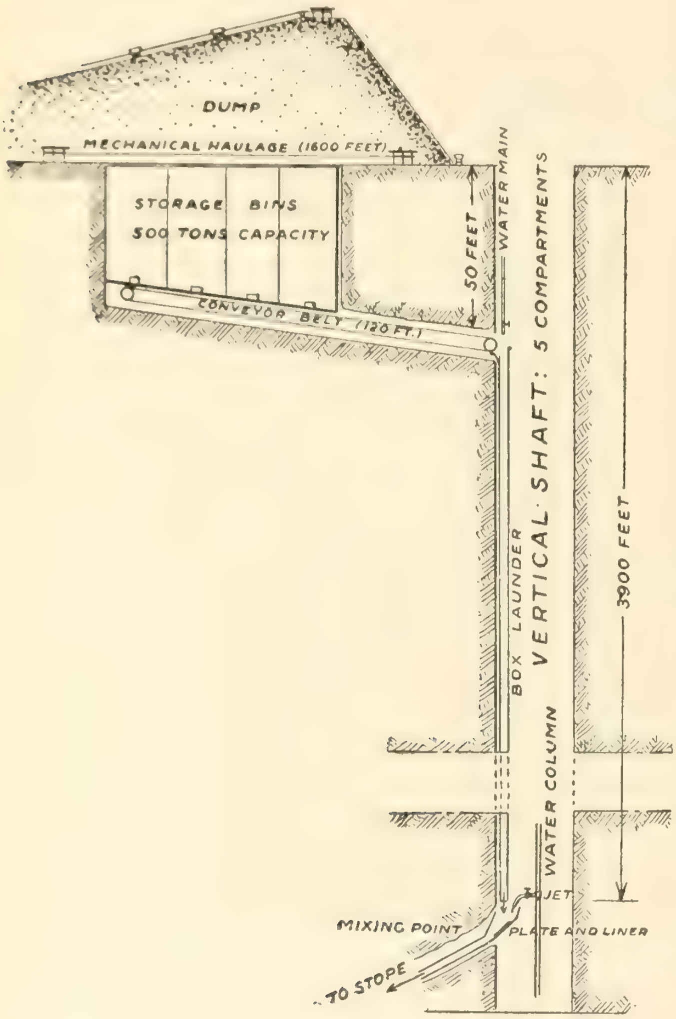
From 5 to 7 per cent. of moisture did not affect the fall, provided that the sides of the box were themselves dry.

From 7 to 9 per cent. of moisture caused the sand gradually to begin adhering to the sides of the launder, where it accumulated slowly.

From 9 per cent. upwards of moisture caused a rapid accumulation of sand along the sides of the launder.

These results were largely influenced, it was found, by the proportion of slime contained in the sand.

The liability of the sand to choke the launder under certain atmospheric conditions renders it essential to have an efficient bell-signalling service between the mining point and the surface bins, as the supply of sand should be regulated in proportion to the quantity of water available for service. Thus, if the sand is supplied too quickly, it has a tendency to pile up at the bottom of the box launder and choke it, as the water is not in that case sufficient to sluice it away. On the other hand, if the sand appears to be coming down slowly, it may be that a certain proportion is sticking to the sides of the launder, on account of there being too great a percentage of moisture. When this is found to be the case, sluicing must be resorted to as mentioned previously, and must be repeated from time to time as the occasion warrants.



Diagrammatic sketch showing arrangement of plant for Sand-filling at great depths. (*Not to scale.*)

Determined attempts were made to use current sands, direct from the tanks, with a view to saving transport from the dump. It was found, however, that this sand, which contains from 12 to 15 per cent. of moisture, gave constant trouble by adhering to the sides of the launder and forming accumulations. These accumulations happened at various points down the launder, but principally at one point about 600 ft. down. Jets of compressed air were introduced with a view to increasing the velocity of the falling stream, and thus preventing the adhesion of the sand. The box launder was furthermore connected with the intake of a ventilating fan near the bottom, and to a Roots blower at the top, the idea being to dry the sides of the box, and thus prevent the sand from sticking. These devices undoubtedly permitted the use of damper sand than could otherwise have been employed, but they were practically of no avail when the sand contained more than 10 per cent. of moisture, and were, consequently, abandoned after prolonged trials.

Unfortunately, it was found necessary to place the box launder in the upcast side of the shaft and in the same compartment with the pump column. Consequently, the box was always wet on the outside, and the water constantly reached the interior. With sand containing no more than 4 per cent. of moisture this would not give rise to any considerable trouble, especially if the launder has its interior surface planed smooth, and the outside tarred. But in order to deal with sand containing up to a maximum of, say 8 per cent. of moisture, the launder should be placed in the driest compartment available on the downcast side.

There is actually a saving in the quantity of water requiring to be pumped out of the mine when the sand-filling plant is in operation. The sand in the stope probably retains at least 10 per cent. of moisture. The sand as sent down contains on an average 3 per cent., and it is calculated that in the course of a good day's run, the water saved from the necessity of being pumped 4,000 ft. to the surface will amount to something like 8,000 gallons.

The labour required to operate the plant is small. A learner in charge of three boys will look after the belt and surface bins, and the underground part, including the mixing point and the stope to be filled, is in charge of a timberman. The sand is brought from the dump to the surface bins by means of mechanical haulage, the actual shovelling and tipping necessary being done by unskilled labour.

Running Cost per Shift.

	s.	d.
Surface—		
25 unskilled labourers at 1s. 6d.	37	6
1 white boy	5	0
3 natives at 1s. 6d.	4	6
Underground—		
1 timberman	20	0
3 boys at 2s.	6	0
	73	0
Power for haulage, belt, pump—		
23 kilowatts per hour at 0.5617d.	13	0
	86	0

Taking an average of 400 tons per shift, the cost works out at 2.58d. per ton.

GEOLOGY OF A PORTION OF LILLOOET MINING DIVISION, B.C.

Mr. Charles Camsell's report to the Director of the Geological Survey of Canada on the "Geology of a Portion of Lillooet Mining Division, Yale District," is included in the "Summary Report" of the Geological Survey for 1911, recently published. Mr. Camsell's report, in part, follows:

"**Introductory Statements.**—Toward the close of the season a rapid reconnaisance was undertaken into the country west of the town of Lillooet and tributary to Bridge river. This recommaissance was made more to determine the needs of the district for geological work and its importance from a mining point of view, than to undertake any geological examination at the time.

"The Lillooet district lies immediately west of the Fraser river, between latitudes 50 and 51 deg. The town of Lillooet is the only place of importance in the district, and is reached in a day by stage either from Ashcroft or from Lytton, or the main line of the Canadian Pacific Railway.

"Considerable placer mining was at one time carried on in the Fraser valley and other valleys of the district, but this class of work is now almost abandoned. Quartz mining has been attempted at Cayoosh creek, and carried out to a small extent on ledges outcropping at Cadwallader creek and McGillivray creek, but the amount of gold extracted has not yet amounted to a great deal, for the reason that the owners of mines have worked with the most primitive methods and virtually without capital.

"No geological work had previously been carried out in this district by the Survey, and the only available authentic information is that obtained from the report of the Provincial Mineralogist for British Columbia, who made a brief reconnaissance of the district in the autumn of 1910.

"Eight days were spent in making a rapid reconnaissance of the district with a view to obtaining information on which to base plans for more extended geological and topographical work. The route followed from Lillooet led up Seton lake to the Mission, thence northward across the divide to Bridge river, and up that stream to Cadwallader creek. Three days were spent in an examination of the mines and region adjacent to Cadwallader creek, and the return to Lillooet was made via Cadawallader and McGillivray creeks, and Anderson and Seton lakes.

Topography, etc.—The topography of the Lillooet district is mountainous and becomes increasingly so the westward. The eastern edge of the district, embracing the Fraser valley and the lower part of Bridge river, lies in the Interior Plateau region. The central and western parts lie in the Coast range. These two features merge gradually into each other, the boundary between them following a line running northwest from the town of Lilllooet. Mountain summits in the eastern portion of the district reach an elevation of a little more than 7,000 ft., giving a vertical relief of about 6,500 ft. In the western part of the district many points reach 9,000 ft. and some exceed that elevation, and the maximum vertical relief is more than 8,000 ft.

Canadian Mining Institute, Western Branch Meeting

"The district enjoys a dry, pleasant climate. It does not contain much land suitable for agriculture, and all of it is confined to the bottoms of main valleys. It is a favorite hunting ground for big game parties, and there is an abundance of grizzly bears, goat, deer, and sheep."

After giving some information concerning the general geology of the district, Mr. Camsell deals with its economic geology, as follows:

"**Economic Geology**.—So far as our present knowledge of the economic geology of the district goes, it contains two classes of ore deposits of proven value, namely, gold placer deposits and gold quartz veins.

"Placer deposits have been worked for a number of years at different localities, the most important of which are on Cayoosh creek, Cadwallader creek, Bridge river, and Fraser river. Recently, however, there has not been a great deal of activity in this class of mining, though a number of hydraulic leases and placer claims are still held with the avowed intention of working them.

"No attempt was made by the writer to examine placer deposits, and only a very cursory examination was made of some of the gold-quartz deposits, the intention being to make a fuller examination later.

"The gold-quartz deposits examined are situated on Cadwallader creek, near its junction with the south fork of Bridge river, and about 75 miles by trail and wagon road from Lillooet. They were discovered in 1897, and since 1898 have been worked every season.

"The quartz veins outcrop on the eastern slope of Cadwallader creek at an elevation of nearly 4,000 ft. above sea-level. The valley slopes are well forested and covered with a heavy mantle of drift which makes surface prospecting difficult.

"The rock formation in which the quartz veins lie is a diorite consisting essentially of feldspar and hornblende. It has a stocklike form elongated in a northwest-southwest direction, and extends from Bridge river up to the Pioneer mine on Cadwallader creek, with a width of probably half a mile. In texture and relative proportion of its constituent minerals it is variable, and in structure massive, though traversed by a network of small quartz veinlets. The ore-bearing veins are of later formation than the veinlets and run in two well-marked directions, namely, N. 20 deg. E. and N. 80 deg. W. magnetic.

"The dioritebis intrusive on the southwest into serpentine, and on the northeast into black and grey slates and andesites, which belong to the lower Cache Creek formation. The diorite probably belongs to the same period of intrusion as the Coast Range batholith, but is older than other plutonic igneous rocks in the district.

"The ore deposits are in fissure veins, which traverse the rock in two main directions, namely, N. 20 deg. E. and N. 80 deg. W. magnetic. They range in width from a few inches up to 6 and 8 ft., and are remarkable for their regularity in dip and strike. The N. 30 deg. W. system of fissures appears much stronger than the other, and one fissure, at least, has been traced for about 1,500 ft. along the surface.

"The ore itself consists of a gangue of white quartz containing pyrite, tetrahedrite, and free gold sparingly disseminated through it. If often has a well-marked banded structure, indictating deposition in an open fissure. The walls of the veins are clean and their faces show some movement along the plane of the vein. The wall rock has been somewhat altered by vein solutions, and contains much crystalline pyrite derived from the vein.

"Free gold can be seen in many of the veins, and can be obtained by panning from almost any of the outcrops. In places the ore is exceedingly rich.

"It would be difficult to give an estimate of the average value of the ore in this camp, because of its richness in certain places and leanness in others. It is safe to say, however, that some of the oreshoots mined must have yielded $50 or more to the ton, while at the same time no parts of the veins so far mined have proved to be entirely barren of gold.

"The mineral claims on which quartz veins are known to outcrop and the number on each claim are as follows:

	Veins.
Lorne group	5
Blackbird	4
Coronation group	2
Pioneer	2
Ida May	2
Countless	2
Forty Thieves	1

"At the present time the only claims on which much development work has been done and from which gold has been extracted are: The Lorne group, the Pioneer, and the Coronation group. On all of these the gold was at first extracted from the ore by the crude method of milling in arrastras operated by water power. More recently a 5-stamp mill has been erected at the Lorne, and a 10-stamp mill at the Coronation group. Both of these use water as the motive power.

"It is stated by the owners of mines in the district that the yield in gold, since the discovery of the deposits in 1897, from the Lorne and Coronation groups alone, amounts to $155,000. The official report, however, of production from the whole Lillooet district up to 1910, is given by the Provincial Department of Mines as $137,744.

"The conclusions drawn from the brief examination made of Cadwallader creek district are that it contains some promising properties, which, if not burdened with too heavy a capitalization, could be worked so as to yield a fair margin of profit; also that further prospecting in the diorite should disclose other gold-bearing quartz veins, because all the ground likely to prove productive has not yet been thoroughly prospected on account of the covering drift.

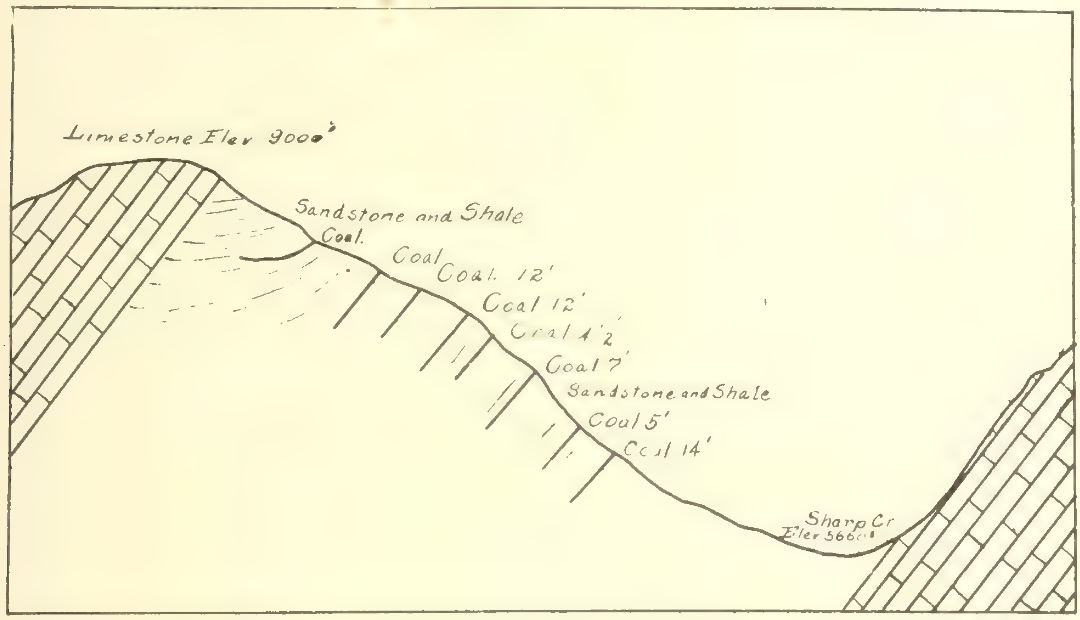
"A promising feature of the deposits is the number of known quartz veins—all of which contain some gold—and the strength and persistence of some that have been followed out. If the depth to which the veins will extend is proportional to the length of their outcrop, then there is hope that they will continue to considerable depth, since the country rock in which they occur is plutonic, and of deep-seated orgin.

"The diorite is the only formation in that district, from which gold ores have been mined, and it is stated that no workable deposits have yet been found in the slates and serpentine through which the diorite is intruded. Gold-bearing quartz veins, however, do occur in the slates, but they have not proved to be as strong and persistent as those in the diorite and are on that account less promising."

Mr. John E. Hardman left Montreal on November 27th for Mexico to examine tin properties under option to a Montreal syndicate.

THE BURNS ANTHRACITE MINES, SHEEP CREEK

The Burns Anthracite mines are among the most portant properties that have been opened in the rovince of Alberta within the last few years. The ines are situated near the headwaters of the south ranch of Sheep Creek, Townships 18 and 19, Range 7 and 8 west of the fifth meridian, the nearest railay towns being Okotoks and Calgary, each distant bout 45 miles. The following information respecting e structural features and character of the coal in e area was presented in a paper read before the Western Branch of the Canadian Mining Institute, and now published with the permission of the Institute and of the author.



Section of Coal Measures at Sharp Creek

Sheep Creek is a stream of considerable size, which rises on the southern slopes of Mount Rea and Mount Tombstone. Flowing from the west and into Sheep Creek are several smaller creeks, known as Ross, Rickert, Charp, Wilson, Stewart, Burns and McKenzie Creeks, in the order named from the south. These creeks cut down into the coal formation several hundreds of feet, showing the coal measures to fine advantage. The valley of Sheep Creek is about one mile wide and six miles long where it runs through the property. It is flat-bottomed and contains some timber and a fine growth of bunch grass.

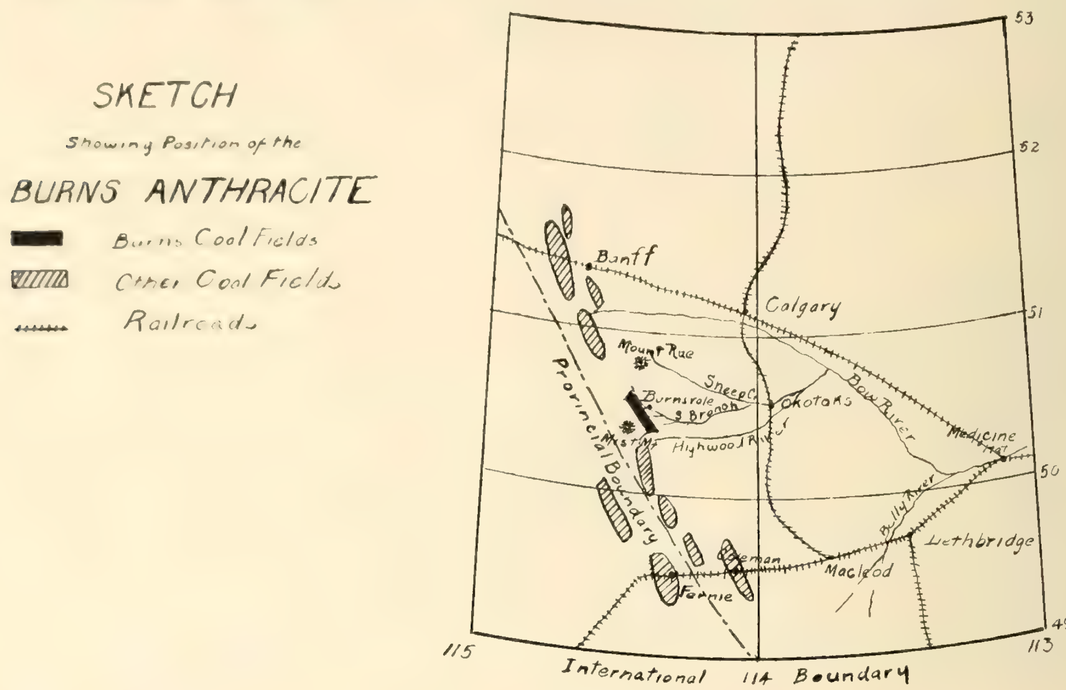
The coal measures have been placed by the Geological Survey of Canada as belonging ot the Lower Cretaceous period. (Kootenay Series). The formation comprises about 400 feet of sandstone, dark shale, conglomerates, and, near the base, some clay and ironstone. At intervals in the strata occur the coal seams and coaly shales, the whole resting on the carboniferous lime. This coal area is about eleven miles long and from one mile to three miles broad, and occurs in a depression between the first limestone range on the east, and the Mist range on the west.

The property consists of 48 coal claims of 320 acres each, in all 15,360 acres of Crown-granted land, beside an area of land leased from the Dominion Government. The measures lies in a long, narrow, synclinal trough, striking north 42 degrees west, and dipping to the westward at an angle varying from 52 to 80 degrees. The southeastern outcrops of coal upon the mountain sides, are at elevations of from 300 to 2,000 feet above the valley of Sheep Creek. But towards the north, at Burns Creek, the coal seams come down to the level of the valley and have every indication of going much deeper

Ten or twelve seams of coal have been exposed on the several creeks and have been traced, by drifts and open cuts, for a distance of five miles. These exposures show that there is fully 100 feet of coal in the measures. The class of coal may be noted from the following analyses, sampled by the writer and assayed by J O'Sullivan of Vancouver, and A. McKillop, of Nelson, B.C. The seams sampled are from 4 ft. 6 in. to 20 feet in thickness.

	Moisture.	Volatile.	Fixed Carbon.	Ash	Sulphur	B.T.U.
Sharp Creek	1.00	12.6	76.6	9.00	0.8	
	1.50	13.1	74.6	10.00	0.8	
	2.00	13.2	76.7	7.6	0.6	
	1.00	13.5	81.00	3.5	1.00	
	1.00	12.5	82.00	3.5	1.00	14,877
	1.00	12.5	81.5	4.00	1.00	

	Moisture.	Volatile.	Fixed Carbon.	Ash.	Sulphur.
Sharp Creek	1.00	11.1	81.1	6.00	0.8
Ross	1.50	9.6	71.1	17.00	0.8
Rickert	1.00	12.7	78.2	7.5	0.6
Burns	1.50	12.1	80.1	5.5	0.8
McKenzie	1.00	12.6	78.0	7.6	0.8
	1.00	11.65	70.65	16.0	0.7
Rickert	1.76	11.17	81.56	5.51	0.0
	1.81	11.74	82.35	4.20	0.0
	2.10	13.43	79.84	4.63	0.0



The following complete analyses from samples from a 7-ft. seam on Rickert Creek were made by A. McKillop, of Nelson, B.C.

	Water.	Carbon.	Ash.	Sulphur.	Hydrogen.	Oxygen & Nitrogen	Coke
Rickert	0.98	84.77	5.42	0.18	3.63	4.48	90.64
	1.02	87.24	5.92	0.18	2.92	3.24	92.81

It will be noticed that some of the seams may be classed as good anthracite. Many of the samples analyzed were taken from the weathered outcrop coal, somewhat robbed of its caloric qualities by long exposure to atmospheric conditions. As already noted the B. t. u. in one pound of coal are 14,877. One pound of this coal, according to tests by Mr. J. O'Sullivan evaporated 15.4 lb. of water. Compared with other coals this may be classed as one of the best in the world, as the following table will show:

A. Burns anthracite (Alberta) six average samples. (O'Sullivan analyses).

B. Bankhead anthracite (Alberta) Gov. Report Canadian Mining 1907-1908.

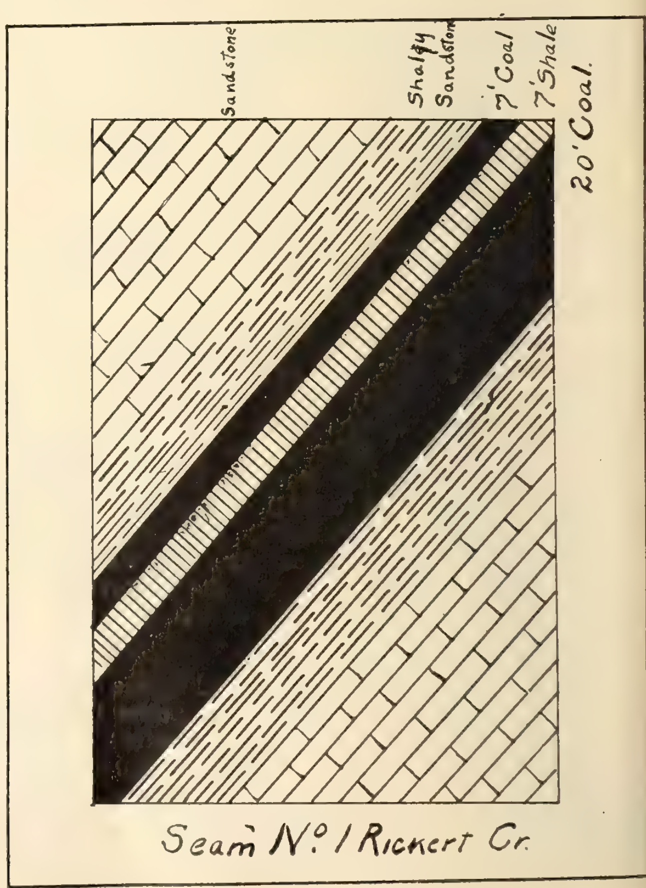
C. Bering River anthracite (U. S. Geol. Report of Controller Bay Coal '08).

D. Penna. anthracite, 9 samples, Geol. Survey Report Penna., 1885.

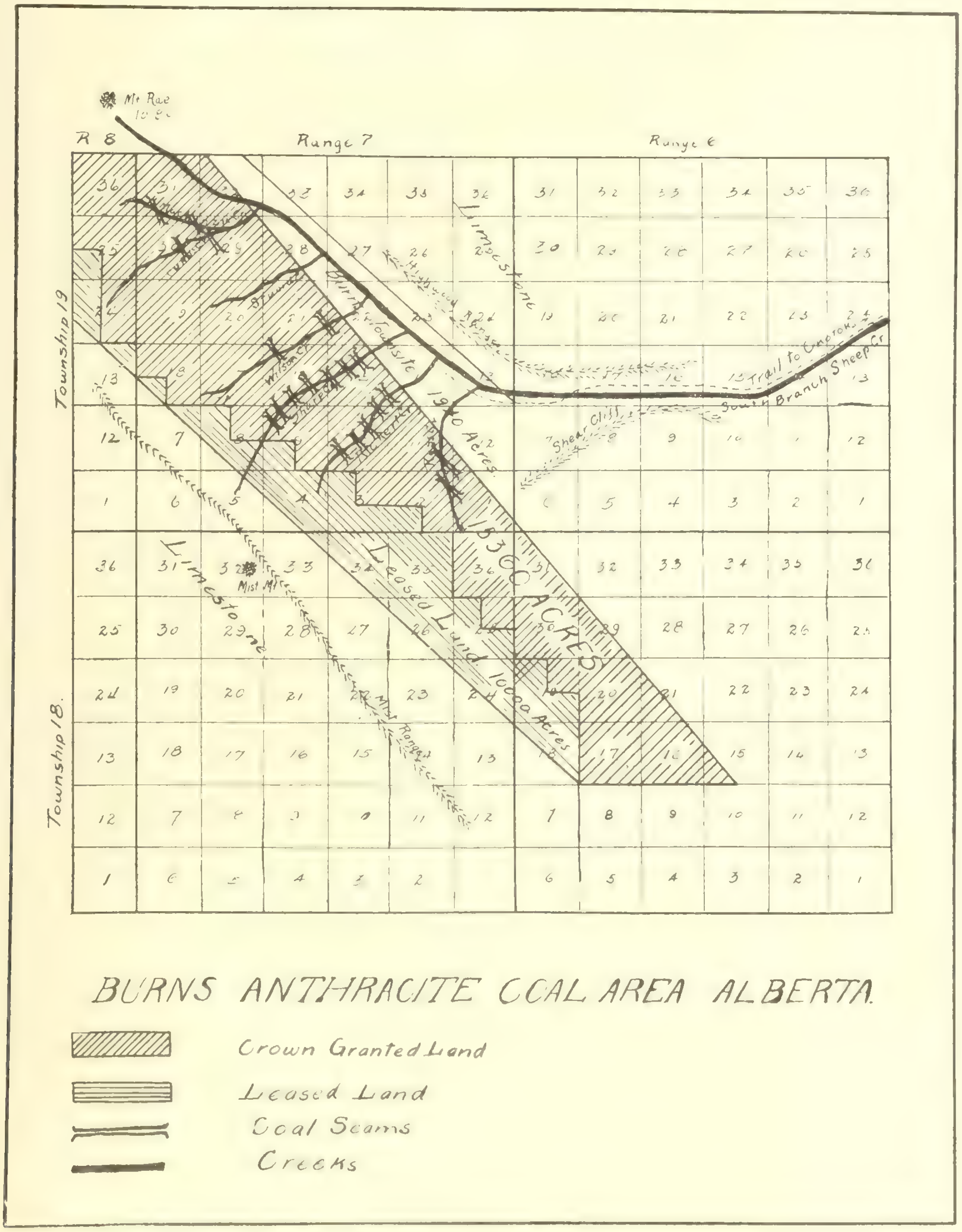
E. South Wales, England, 10 samples Andres Treatise Vol 1.

	Moisture.	Volatile.	Carbon.	Ash.	Sulphur.	B.T.U.
A.	1.27	11.98	83.22	4.76	0.57	14.877
B.	0.50	8.00	83.50	8.76	0.14	14.00
C.	8.34	5.42	81.38	4.86	0.98	13.17
D.	3.39	3.81	83.79	8.14	0.59	13.999
E.		7.495	88.16	3.099	1.247	14.884

The structure of this coal is slightly different from that of the best known anthracite. Much of it is jet black and it burns with a feeble blue flame and has great calorific values. According to Dana, good anth-



acite should contain from 78 to 88 per cent. fixed carbon, the average being about 83 per cent.; from 3 to 4 per cent. hydrogen; from 4 to 6 per cent. oxygen, and from 4 to 7 per cent. earthy matter, and not more than one per cent. sulphur. By comparing the statement of this authority with the analysis of coal taken from Seam No. 1 on Rickert Creek, it will be seen that in place. It is evident that the Sheep Creek anthracite coal measures are a northern extension of the same Cretaceous series as the Crow's Nest Pass coal fields; the coal having been changed from bituminous as at Fernie, to anthracite as at Sheep Creek, by the superincumbent pressure and metamorphosis, caused by the upheaval of the limestone range. It is apparent that



this coal may be classed as a good anthracite. There is no hard coal in Canada that is its superior.

The late Dr. Dawson in his report on the Crow's Nest Pass coal lands and Cascade Basin sections, mentions having been to the headwaters of Sheep Creek, during the summer of 1884 (Part B, Annual Report 1885, pp. 101 to 168 B). He remarks that loose fragments of coal found in the upper part of Sheep Creek, in the northern extremity of the Crow's Nest trough, show a tendency to become anthracite but the beds were not found the future development of these coal areas will show the lower seams to be anthracite and the upper seams bituminous, as the pressure and heat were greater at the lower seams. The future shipments from these mines may include anthracite, steam and coking coal.

It is difficult to arrive at the amount of coal that could be extracted from this area, owing to the limited amount of work done. But it appears that the coal seams are in an unbroken condition throughout the full length of the property, a distance of 11 miles.

and outcrops from 1,000 to 2,000 feet above the level of the valley, that there is likely to be found an aggregate of 12 or 15 coal seams that will give a tonnage amounting into the hundreds of millions of tons, which would be able to maintain an output of 10,000 tons daily for many generations.

The topography of the country is all in favour of economical mining. A number of the coal seams come down to the level of the valley and can easily be reached by tunnels at the valley floor. Any of the coal seams can be drifted on from either side of the several creeks that cut the formation. Thus a chain of collieries can be operated along the valley. The importance of so much coal above the tunnel level can be readily appreciated. The power for ventilating fans and other purposes can be generated from the waterpower of the creeks. Even the angle of dip of the seams may be in favour of economical mining. The coal will fall from the miner's pick into the chute and be taken thence by large cars direct to the tipple, thus reducing to a minimum the cost of installing, operating, and maintaining an underground haulage system. The Burns' coal mines, if properly equipped with modern machinery, and properly managed, should put coal on the cars as cheaply as any competitor. A hard coal of such excellent quality and so cheaply mined should play an important part in supplying the markets of Western Canada and the northwestern part of the United States.

It may be said that this coal area was discovered by Rickertand Brown, of Highriver, Alberta, and acquired by Patrick Burns, of Calgary, Alberta. But to the late lamented Dr. Dawson belongs the honour of being the first white man to explore the headwaters of Sheep creek. Had Dr. Dawson descended Rickert or Sharp creek instead of Burns creek, as he appears to have done, he would have seen the great thick seams of beautiful coal exposed on these creeks, and the history of Sheep creek would be written differently at this date.

As already stated, these coal properties are situated about 45 miles from Okotoks, a town on the Calgary-Macleod branch of the Canadian Pacific Railway. The difference of elevation between the coal property and Okotoks is about 2,150 feet, or about 48 feet to the mile. It is said to be the intention of the owner to build a railway between these two points and operate the mines with the most modern and scientific machinery obtainable, for safe and economical mining.

Meanwhile the seams are being thoroughly prospected at different horizons so that the nature of the roof and floor texture, and strength of coal may be ascertained before any permanent opening shall be made. At some future time, I may submit for your consideration a paper on the proposed method of working these angle seams. The extraction of coal is a question of paramount importance under the most favourable conditions, but especially is it so in a Rocky Mountain coal basin where the thrusting and uplifting of the measures have been so great.

LEAD BOUNTIES

According to the "Daily News, the executive of the British Columbia Mining Association passed the following resolution at a meeting held in Nelson on November 18:

"We, the undersigned, who have been producers of lead ore since the inception of the Lead Bounty Act, or who are dependent for the marketing of our ore upon the lead-smelting industry, respectfully request your favourable consideration, and that of your Cabinet of the following memorial:

"1. That the lead-mining industry is a very important one to the Dominion, and especially to British Columbia, but it is handicapped and is entitled to a considerable degree of encouragement for the following reasons:

"(a) The distance from market; the greater part of the lead produced having to be hauled practically the whole width of the continent to the large manufacturing centres in the East.

"(b) The high rate of wages imposed upon the industry by the scale current in similar mines in the United States, which mines by reason of the United States lead tariff obtain far higher prices for their product, the average difference during ten years ended with 1911 having been more than $20 per ton.

"(c) The tariff upon supplies and machinery used by those engaged in the industry.

"2. That the lead bounty, which will be discontinued under the present Act at June 30, 1913, as, by insuring a stable minimum price, been exceedingly beneficial to the lead-mining industry; so much so, that, without the advantage so obtained, the industry would have been completely crippled. This bounty, if renewed, will continue to benefit and stabilize the industry, but the logical ad permanent solution seems to be the imposition of such duties upon lead as would be the equivalent of the present duty and bounty. To retain the home market compensating increases in the duties upon lead in its manufactured forms will then also be necessary.

"3. That without the aid of such additional duties or the constinuance of the bounty the inducement to spend the large sums which are necessary in exploration and development will cease; the present ore reserves in our mines will be exhausetd after intermittent operation and the lead-mining industry will cease to exist.

"4. The undersigned, therefore, respectfully request that you appoint a special commission to enquire thoroughly into the form and extent of permanent encouragement to the lead industry, and that this commission might also properly consider some form of encouragement to the zinc-mining industry, zinc-mining being closely allied to lead-mining and at present is conducted in British Columbia under very great difficulties.

"5. That pending the submission to you of the report of such commission and until such time as their recommendations may be made effective by legislation, we respectfully request that the present Lead Bounty Act, expiring June 30, 1913, be extended, but only as to the then uneared balance remaining of the original amount set aside."

GEOLOGY OF COMOX AND SUQUASH COAL FIELDS, B.C.

"The Comox and Suquash coal fields, Vancouver island, were visited by Mr. Chas. H. Clapp, of the Geological Survey of Canada, in order to compare their geological conditions with those existing in the Nanaimo field," says Mr. Clapp, in his official report, and, therefore, only a few notes can be given concerning them, but they may serve to show some of the similarities and differences of the various coal fields.

COMOX FIELD.

"In the Comox field the coal is found in several seams that occur in a sandstone formation closely resembling the Protection formation of the Nanaimo series. Three of the seams have been mined. The formation, which may be called the Comox formation, consists chiefly of a white or greyish-white sandstone, composed largely of rounded quartz grains with a coating of kaolin, and with accessory chloritic micas. Interbedded in the sandstone are thin beds of carbonaceous sandy shale, with which the coal is usually associated. The formation has a maximum thickness of about 800 ft. and rests directly on the metamorphic volcanics of the Vancouver group. It is overlain by a thick group of shales, called the Trent River shales, which are very much like the Cedar District shales that overlie the Protection sandstone in the Nanaimo district. The sediments of the Comox basin have a much simpler and more regular structure than those of the Nanaimo basin, and form, in general, a simple monolcine with a low uniform dip of about 10 deg. to the northeast. The coal seams are more regular than those of the Nanaimo basin, and must be the result of a more uniform condition of sedimentation, although a similar uniformity of conditions seems to have existed in the Nanaimo basin during the deposition of the Protection formation. However, the coal seams of the Comox district show, but to a less degree, the pinching and swelling and sharp rolls so characteristic of the Nanaimo coal seams. Large 'wants,' due to a replacement of the coal by silt are probably more frequent in the Comox field. The lowest seam of the former field occurs very near the base of the Comox sandstone, and as the Comox basin resembles the Nanaimo basin in that the crystalline rock surface, on which the sediments were deposited, was very irregular, many of the higher irregularities of the base remained above the depositional level when the lowest seam was deposited, and, in consequence, the lowest seam is frequently cut out by knobs of the underlying volcanics projecting through it. There is also another feature which is not met with in the Nanaimo field. North of the producing mine in the Comox field, between Browns and Puntledge rivers, a dacite porphyry has broken through the Comox sandstone and forms a flow or intrusive sheet, which overlies it. Near the decite porphyry intrusion, which occurs near the outcrop of the lowest seam on Browns river, the coal is broken, partially coked, and rendered valueless. It is probable that the intrusion of dacite porphyry occurred in early Tertiary times and was a phase of the widespread Eocene volcanic activity.

SUQUASH FIELD.

"Conditions in the Suquash field are similar in many respects to those in the Comox field. Several seams of coal occur in a formation consisting chiefly of a grey, siliceous sandstone resembling that of the Comox and Suquash sandstone are, however, thicker, and more numerous, and the shale is finer-grained and more plastic, some of it being a clay shale apparently of excellent quality. The structure of the measures is very regular and appears to be, in general, a broad syncline, striking about N. 60 deg. E., and pitching slightly to the northeast. The dips are very low, less than 10 deg., and although there are several local rolls there are no sharp ones. The measures are broken by a few normal faults of very small displacement. The coal seams are also very regular and do not pinch and swell as do those of the Nanaimo and Comox basins. The known seams are, however, thin, and the seam mined at present contains a large number of very persistent partings of various kinds. As in the case of the Comox basin, the coal measures have been intruded by Tertiary volcanic rocks, in the Suquash field by a trachyte porphyry. The trachyte porphyry occurs in the southern part of the basin on Haddington island, where it is quarried extensively and furnishes the best grade of building stone on the coast. It probably occurs as an injected body.

"The present knowledge of the Suquash field is meagre, since the measures are largely drift-covered and only a few bores have been put down. The development work is also small in amount and confined to two seams. The basin is, however, somewhat larger than generally supposed, containing Malcolm and Cormorant islands and possibly extending southwest to Quatsino sound. On account of the uniformity and regularity of the coal seams and strata and their small amount of disturbance, the mining conditions are excellent. The coal is of good quality, burning with a long flame and little smoke. The large number of partings in the seam which is at present being worked, and the thinness of the other known seams are the chief disadvantages of the field. The conditions are much, however, as to greatly encourage further development and prospecting, especially in the lower part of the measures."

WORK AT THE GOLD FIELDS' MINES

The mines on the Rand which are under the control of the Consolidated Gold Fields of South Africa milled 3,616,330 tons of ore during the twelve months ended 30th June last for a yield of £3,975,167, of which £2,671,024, or 67.2 per cent., went to working expenditure, and £1,304,143, or 32.8 per cent., to profit. In the preceding year 3,269,160 tons of ore realized £3,931,748, divided into £2,543,052, or 64.7 per cent., working expenditure, and £1,388,696, or 35.3 per cent., profit. Working costs, exclusive of expenditure on renewals and additions to plant, averaged 14s 9.264d per ton last year, as against the average of 19s 2.5d per ton for the 21,417,148 tons milled by the other mines of the Rand for the same period. The average value of the residues from the Gold Fields' mines has been reduced by 2.716d, equal to a total amount of £40,925, and at the same time the average metallurgical costs have been decreased by 1.923d per ton milled, equal to a total amount of £28,976. The average metallurgical costs for the past year, which include the cost of crushing, sorting and surface transport of ore, were 3s 8.264d, and the average residues 0.501 dwt. per ton milled, or a recovery of 94.569 per cent.

WHIPSAW CREEK DISTRICT, SIMILKAMEEN, B.C.

In the "Summary Report" of the Geological Survey of Canada, lately issued, Mr. Charles Camsell thus briefly describes a part of Similikameen district of British Columbia:

"Whipsaw creek is a tributary of the Similkameen river, lying to the northeast of the Skagit district. Claims were taken up at the head of this stream in 1908 and 1909, and a certain amount of prospecting and development work done on them. They lie on either side of the main Dewdney trail and are most conveniently reached from Princeton, which is distant about 20 miles.

"In this area a gneissic granodiorite is intrusive into hornblende and chlorite schists, which strike N. 20 deg. W. and dip to the west. The granodiorite has produced considerable contact metamorphism in the schists and sends many apophyses into them. Both rocks are traversed by acid dikes.

"The mineral deposits belong to one type, namely, fissure veins containing lead and zinc. The veins are found in the schists in the zone of contact metamorphism, and occupy a cognate set of fissures striking N. 2 deg. W. and N. 45 deg. W. Fissuring and ore deposition are probably both connected with the intrusion of the granodiorite.

"**Lucky Pair Group.**—The Lucky Pair group consists of three mineral claims lying on the south side of Whipsaw creek. Most of the development work on this group was concentrated in a tunnel 230 ft. in length. Owing to a miscalculation this tunnel does not cut the vein, which was afterward found by a 10-ft. crosscut 45 feet from the tunnel entry.

"The ore deposit is a well-defined fissure vein, 18 in. wide, in a zone of brecciation, cutting the schists and striking N. 45 deg. W. The veins has a banded structure, and is filled with zinc blende, galena, chalcopyrite, and pyrite, in a gangue of quartz. The whole is greatly oxidized and much of the sulphides has been leached out. The deposit is of low grade and the chief valuable metal is silver.

"**Marian Group.**—The Marian group consists of five mineral claims situated on the north side of Whipsaw creek, near its head. The country rock in these claims is granodiorite, in which are exposed three distinct veins, respectively, 36, 34, and 12 in. in width. They all contain blende, galena chalcopyrite, and pyrite, in a gangue of quartz, and are much altered by surface oxidation. Samples taken for assay show the ore to be very low grade.

"**S. and M. Group.**—The S. and M. group joins the Marian group on the east and is developed by a number of open-cuts and three short tunnels. The country rock is a schist, the surface of which is very much decomposed, and holds hard nodules of ore. None of the tunnels have penetrated into the solid rock beyond the zone of oxidation."

CHARACTERS ON THE COBALT SILVER ORES

Reginald E. Hore, Houghton, Mich.

The silver in ores of the Cobalt district occurs almost entirely as the native metal. There are numerous compounds of silver occurring in the ores, but they are present in very small quantity and are the source of a comparatively insignificant amount of the precious metal.

The silver is always found intimately associated with arsenides and cobalt and nickel. These metals are commonly present as constituents of smaltite, smaltite-chloanthite, and niccolite.

The gangue minerals are dolomite and calcite. Quartz occurs, but is an important constituent in but few of the veins.

The ore occurs chiefly in the form of very high grade, but very thin veins. The high grade ore shipped averages over 1,000 ounces per ton. For instance, that produced by the Crown Reserve mine during 1911 averaged 4,641 ounces per ton. The veins furnishing this ore are commonly only a few inches in thickness and the ore shoots are usually small.

The veins are in most cases vertical, or nearly so. The richest and most numerous veins are in Huronian sediments. A smaller number of veins in the Keewatin complex and the Keweenawan diabase have contributed to the output of the high grade ore. The veins in the Keewatin are as a rule much less regular than those in the Huronian.

On either side of many of the rich veins there are payable amounts of silver in the country rock. In some cases the wall rock is remarkably barren; but in most cases there is milling ore for a foot or two on each side of the high grade ore, and in some cases the wall rocks are being stoped for a total width of 20 feet.

The silver in the wall rock occurs almost entirely as a filling in minute crevices. It is rarely distributed through the rock, as though it had replaced the rock constituents, but is rather present as a simple deposit in small joints and fissures. In milling ore, carrying 30 or 40 ounces per ton, there is usually silver visible in the form of small flakes on the natural cleavage faces of the rock. In a few instances good assays are obtained from ore which shows no silver to the naked eye, and it is possible that this unusual ore may contain silver as a replacment of the rock constituents rather than as a simple filling.

In the milling ore in some workings there is frequently to be seen ruby silver in the form of a thin reddish film. It is in a fine state of division, and ore containing it presents the appearance of having been coated with thin red paint. This ruby silver is naturally difficult to recover, and much of it escapes in the mills. Appreciable increases in the values in slime tails are noticed when an unusually large amount of such ore is being concentrated.

In the mines it is frequently found that there are several thin veins of high grade ore spaced a few feet apart. In such cases the rock between the veins usually contains enough silver to make it workable. Many of the wide stopes show two or three veins, often less than one inch in width, separated by rock which has small amounts of visible silver on its cleavage faces.

That the silver is usually in the form of a filling rather than as replacement, is shown by the experience in treating broken rock of different sizes. It has been found in two mines that in mining low grade ore that which breaks into large blocks, because of less fissuring, contains much less silver than does the fines. One reason for this is that some fines from high grade ore is mixed with fines from the low grade; but it is also noted of ore in which no high grade is visible. In one mine the large blocks of such rock are being left in the mine, while the smaller sizes are being profitably milled. Tests at one plant in sorting the smaller sizes of low grade ore before crushing, did not give results to warrant such sorting. It was found that considerable barren rock could be picked out from the diabase ore, but not from that which was present in the Huronian or Keewatin rocks.

For some time the only silver sent out from Cobalt was in the form of high grade ore which was smelted at American furnaces. Later four plants were erected for the treatment of such ores in Canada. Some low grade ores are shipped to American smelters to be treated with other ores.

Milling at Cobalt became important in 1909, and since then a constantly increasing percentage of the shipments has been concentrates. At the cyanide plants the recovery from low grade ore has been shipped in the form of bullion. During the past year a great increase in the amount of bullion shipped has resulted from the introduction of the Nipissing's amalgamation-cyanidation method of treating high grade ore. Another, but comparatively small contribution to the bullion output, results from the recovery of metallics in Campbell and Deyell's sampling plant.

The character of the shipments for the several years since the discovery of the deposits is shown by the following table taken from the report of Thos. W. Gibson, Deputy Minister of Mines.

Contents of Ore Produced During Years 1904-1910.

Year.	Shipments ore and concentrates. Tons.	Nickel. Tons.	Nickel. Value.	Cobalt. Tons.	Cobalt. Value.	Arsenic. Tons.	Arsenic. Value.	Silver. Ounces.	Silver. Value.	Total Value.
1904	158	14	$3,467	16	$19,960	72	$903	206,875	$111,887	$136,217
1905	2,144	75	10,000	118	100,000	549	2,693	2,451,356	1,360,503	1,473,196
1906	5,335	160	....	321	80,704	1,440	15,858	5,401,766	3,667,551	3,764,113
1907	14,788	370	1,174	739	104,426	2,958	40,104	10,023,311	6,155,391	6,301,095
1908	25,624	612	....	1,224	111,118	3,672	40,373	19,437,875	9,133,378	9,284,869
1909	30,677	766	....	1,533	94,969	4,294	61,039	25,897,825	12,461,576	12,617,580
1910	34,282	604	....	1,098	54,699	4,897	70,709	30,645,181	15,478,047	15,603,455
Total	113,008	2,601	14,641	5,049	565,872	17,891	231,679	94,464,189	48,368,333	49,180,525

Note.—The production of 1910 includes 980,633 ounces bullion.

*From report of Thos. W. Gibson.

The returns for arsenic, cobalt and nickel, present in large quantity in the ores, are very small. Regarding these metals Mr. Gibson writes in his report:

"Data are not entirely wanting with regard to the arsenic contents of the low grade ores smelted in the United States. The United States Metals Refining Company of New York, whose works are at Chrome, N. J., smelted up to 31st December, 1910, 10,462 tons of Cobalt ore averaging 221.3 ounces of silver and 2.87 per cent. of arsenic. The American Smelting and Refining Company at their Denver, Col., works up to the same time smelted 28,097 tons containing an average of 184.3 ounces of silver and 4.19 per cent. of arsenic. Thus, these two companies found an average of 3.82 per cent. of arsenic in 38,559 tons of ore, whose silver contents averaged 194.4 ounces per ton. Assuming that the proportion between arsenic on the one hand, and cobalt and nickel on the other, was the same in these low grade ores as in the high grade material treated by the Ontario smelting companies, 3.82 per cent. of arsenic would imply the presence of .833 per cent. of cobalt, and .458 per cent. of nickel.

"If, then, the arsenic contents of the entire production at Cobalt were known, we could arrive at a fairly close approximation of the cobalt and nickel output; but this factor in the problem is wanting. Say, however, that of the 27,437 tons of ore shipped out in 1910, in addition to the concentrates, one-fourth was high-grade, and three-fourths low grade. This would give 6,859 tons of the former and 20.578 of the latter. Adding the concentrates, 6 845 tons, to the high grade ore, we have 13,704 tons of material containing 6.76 per cent. cobalt, 3.72 per cent. nickel, and 30 per cent. arsenic; and 20,578 tons containing, as we have assumed, .833 per cent. cobalt, .458 per cent. nickel, and 3.7 per cent. arsenic. The yield of the several substances would, therefore, be:

	Cobalt. Tons.	Nickel. Tons.	Arsenic. Tons.
High-grade ore, etc.	926.39	509.78	4.111.20
Low-grade ore, etc.	171.41	94.24	786.07
Total	1.097.80	604.02	4.897.27

or for the entire product of the mines for 1910, namely, 34.282 tons of ore and concentrates, an average of 3.20 per cent. cobalt, 1.47 per cent. nickel and 14.28 per cent. arsenic. For arsenic the figures are practically the same as were assumed in last year's report, namely

14 per cent., but are somewhat lower for cobalt and nickel, the assumed percentages being then 5 and $2\frac{1}{2}$ per cent respectively."

The following figures from the report of the La Rose mine give some idea of the character of the ore shipped and the cost of mining and marketing it:

Shipments.

	Dry Tons.	Net Value Per Ton.	Ounces Silver.	Net Value.	Per Cent. of Total Net Value.
Silver-Cobalt-Nickel Ore	1,770.995	$861.36	3,066,489.51	$1,525,455.10	75.7
Low Grade Silicious Ore	603.204	76.93	112,066.79	46,403.21	2.3
Nuggets	12.262	11,864.06	274,598.53	145,477.16	7.2
Concentrates	1,174.951	252.82	639,554.50	297,056.02	14.8
Total	3,561.412	$441.62	4,092,709.33	$2,014,391.49	100.0

Average Assay of Shipments.

	Ozs. Silver Per Ton.
Silver-Cobalt-Nickel Ore	1,731.51
Low Grade Silicious Ore	185.79
Nuggets	22,394.27
Concentrates	544.32
Average of Total	897.25

Summary of Shipments, 1911.

Dry Tons Shipped	3,561.412
Gross Ounces Silver Contained	4,092,709.33
Gross Silver Value	$2,191,524.34
Average Price Received per ounce—cents	53.55
Smelter Deduction, Freight and Treatment	177,132.85
Net Value Received from Ore Sales	$2,014,391.49

Cost of Producing Silver.

Based on 3,429.514 tons containing 3,691,797.26 ozs.

		Per Ton Shipping Ore.	Per Oz. Silver.
Mine Operation—			
Trenching	$5,717.12		
Development and Exploration	125,474.78		
Stoping	59,408.01		
Tramming	54,325.59		
Timbering	16,149.17		
Hoisting	19,715.32		
Pumping	6,887.29		
Ore Sorting and Loading	48,016.91		
Assaying and Engineering	4,783.08		
Administration and Office	28,560.17		
Boarding House Expense	13,461.66		
Insurance and Taxes	30,298.52		
General Expense	12,299.33		
	$425,096.95	$123.95	$ .1151
Concentration	109,515.65	31.93	.0297
Depreciation	13,501.82	3.94	.0037
Marketing Ore	187,815.28	54.77	.0509
Corporation and Traveling Expense	2,673.24	.78	.0007
	$738,602.94	$215.37	$ .2001
University Mine Account	437.82	.12	.0001
	$739,040.76	$215.49	$ .2002
Less Rents, Interest and Discounts	30,361.86	8.85	.0082
Total Cost of Production	$708,678.90	$206.64	$ .1920

Marketing Expense on Production.

		Per Cent. of Gross		Per Cent. of Gross
Gross Silver Value	$101,559.80	5.14		
Value of Smelter Deduction on Silver			$1,977,764.67	100.00
Treatment Charges	26,159.72	1.32		
Freight	39,575.04	2.00	167,294.56	8.46
Net Received from Ore Sales			$1,810,470.11	
Assaying, Sampling, Smelter Representatives and Ore Insurance	20,520.72	1.04		
Total Marketing Expense	$187,815.28	9.50		

The remarkable results obtained in mining the ex-ceptionally rich ore at the Crown Reserve Mine are indicated by the following tables:

Total Shipments to Date.

Year.	Dry Weight. Tons.	Gross Ounces.	Gross Value.	Net Value.
1908..........	650.78	1,798,954	$ 910,350.62	$ 854,788.89
1909..........	3,093.00	4,034,325	2,080,156.08	1,895,484.92
1910..........	2,753.00	3,248,196	1,757,824.27	1,633,716.66
1911..........	7,545.37	3,430,902	1,833,516.80	1,751,300.21
	7,545.37	12,512,377	$6,581,847.77	$6,135,290.68

Average Cost of Silver to Date.

Year.	Production. in Ounces.	Total Cost.	Price Received per Ounce.	Cost per Ounce.	Profit per Ounce.
1908..........	1,798,954	$ 135,073.56	50.64 c.	7.508 c.	43.132 c.
1909..........	4,034,325	416,140.90	51.56	10.31	41.25
1910..........	3,248,196	389,700.48	54.1	11.97	42.13
1911..........	2,430,902	366,108.53	53.46	10.671	42.79
	12,512,377	$1,307,023.47	52.603c. Aver.	10.344 c. Aver.	42.259 c. Aver.

Average Value of Ore to Date.

Year.	Ounces. Low Grade,	Ounces High Grade,	Ounces. Mill Ore,	Fineness. Bullion
1908....	4,156	231	..	...
1909....	4,784	184	..	869 Thousandths
1910....	3,611	103	..	913 "
1911....	4,641	165	24	956 "

Dividends Paid to Date.

Year.	Amount Paid.
1908.........................	$ 353,762.80
1909.........................	1,238,169.80
1910.........................	1,061,288.40
1911.........................	1,061,288.40
Total....................	$3,714,509.40

Distribution of Cost, 1911.

		Cost per Ounce.
Freight, Treatment and Smelter Deductions...............	$ 81,628.33	2.491 c.
Ore Handling...............	42,934.00	1.310
Mining Development	87,093.05	2.657
Power and Lights	26,875.76	.820
Maintenance Building, Plant and Equipment...............	15,212.98	.464
Mine, General Expenses.......	21,351.75	.651
Superintendence and Travelling	17,114.29	.522
Head Office Expenses.........	19,715.94	.601
Depreciation Building, Plant and Equipment...........	31,182.94	.952
	$343,109.04	10.468 c.
Milling......................	22,999.49	14.671
Total Ore Cost..........	$366,108.53	10.671 c.

SPECIAL CORRESPONDENCE

ONTARIO.

COBALT, SOUTH LORRAIN, GOWGANDA

Buffalo Bullion.—The Buffalo mine is this year following the example of the Crown Reserve in making a surprise distribution of profits to shareholders at Christmas. The regularly quarterly distribution from the Buffalo mine amounts to 8 per cent., so that the total for the last quarter of 1912 will amount to 16 per cent. The Buffalo rushed shipments during the past two months and its total production will be about the same as last year. The high grade mill is now ready and all concentrates and high grade will be melted down down and shipped as bullion, the process used approximating closely to that in vogue at the Nipissing high grade mill. The first "pour" was made last week.

Right of Way.—New discoveries of importance continue to be made. The Right of Way now announces that another new orebody has been cut, though its permanent importance to this mine has yet to be demonstrated. At the 80-foot level a three-inch vein of smaltite carrying 150 ounces of silver to the ton has been drifted upon as far as the Princess line, and a crosscut is now being driven to pick it up at the 140-foot level. There appears little doubt that the discovery wil be of importance to the La Rose Consolidated through their Princess property.

Mill for the Mann.—It is understood that the management of the Mann mine at Gowganda is contemplating the erection of a small concentrator as the low grade ore is piling up on the dump. Early in the year a 15-ton shipment of 3,000-ounce ore was made, and at the present time another twenty tons of a similar grade are on hand awaiting the time when the railway to Elk lake is completed. Work on the property this year was devoted entirely to the 90-foot level where three veins have been worked. The ore moved this year is

reported to amount to $100,000. The union focussed its attack upon the Hollinger mill and mine. This company had established their bunk houses in the town of Timmins about half a mile away from the mine, and the men had to go to and from work along roads which could easily be picketed. Mr. P. A. Robbins had at a few days' notice to provide sleeping quarters for the men at the time, and also feed hem, no light task, as will be readily admitted.

The situation at the Dome is different. The company has its bunk houses on its property, and once they got their men back they saw that they were not molested, establishing a form of martial law on the property. In addition, it was much easier with the system of stoping ore in vogue to keep the bins at the mill full with very few drills running, and it is not likely that the production will suffer to any appreciable degree. Their only care now is to lay the pipe line from the mill to Porcupine lake, a listance of some miles. It was found last fall that the present supply of water for the mill was entirely inadequate and men were put on laying pipe to Porcupine lake at once. The strike caught them as they began to lay the pipe, and as it has been difficult to protect men at work in the trenches further linking up of the pipe has been delayed until now.

Three companies have men engaged on construction work at their new mills, namely, the McIntyre, McEaneny, and Dome lake.

The Western Federation of Miners is actively helping the men, Mr. F. J. Mahoney, the vice-president, conducting the strike in person. But wherever men can escape the attention of the pickets they are slipping back to work. In addition, they have been discouraged by the refusal of the Cobalt miners to come out in sympathy.

The Hollinger Gold Mines has issued summonses against all the men who struck, under the Lemieux Act. They claim that the men left them without giving any notice, which the Industrial Act makes an indictable offence. Dozens of cases have already risen out of the strike, and the litigation if not called off by mutual arrangement seems likely to be long and costly.

Harricana Specimens.—A number of prospectors have stampeded to the Harricana River, 140 miles east of Cochrane, on the Transcontinental Railway. The discovery is at a small lake just off the course of the Harricana and about forty miles north of the track. Some very rich specimens have been brought out of this field.

Crown Chartered Struggles.—The directors of the Crown Chartered Mining Company are making a desperate attempt to raise sufficient money to pay off the outstanding indebtedness on the Davidson claim so as to prevent it reverting to its former owners. There is yet $60,000 to raise. In order to allow them to make the attempt the sale of the plant has been again adjourned. The claims against the company can be arranged if the shareholders provide $85,000 for the purpose of paying the balance for the Davidson claim and for development and the erection of a ten-stamp mill. It is proposed to found a new company, known as the Davidson Gold Mines, Limited, and to issue new stock at the rate of one new share for two held at present. To provide the amount of $85,000, shareholders will be asked to subscribe for 350,000 shares of the treasury stock at 25 cents per share.

Mr. C. F. Dike, jr., the late manager of the property recommends the erection of a five-stamp mill, and expresses the opinion that by the operation of such a mill the property would be self-supporting.

More Mills—A contract has been let for the erection of a ten-stamp mill on the Three Nations property in Whitney township. The capacity of the mill will be about 50 tons per day. The Three Nations mine is quite out of the productive area, as it has yet been demonstrated that there is sufficient tonnage to warrant a ten-stamp mill.

Mr. R. B. Watson, general manager of the La Rose and Nipissing, has been in Porcupine to make an examination of the Foley-O'Brien for the interests in control.

In doing assessment work on a group of the Edwards claims, near the Dome lake, a big dike has been discovered. This is now being sampled by the Canadian Mining and Exploration Company. A preliminary sampling by the owners of the claim gave an average assay of $8 a ton.

The Tough Claims.—The Tough claims, in which Mr. C. A. Foster now has a controlling interest, continue to show very good results. The main vein has been opened up for 350 feet, and while the paystreak is not on the average more than five inches wide, it is so rich that the ore is worth shipping, running on an average not less than $350 to the ton. A carload of ore is now being taken out of the vein and a shipment will be made soon.

Machinery is now beginning to arrive for the Swastika mill. At the Lucky Cross, the concrete work has been finished and framing has been commenced, but it is not expected that delivery of machinery will be made till the new year.

PORCUPINE AND SWASTIKA.

Labour Troubles.—The strike in the Porcupine camp still continues to regard development; in fact there is none underground save at the Hollinger, Dome and the three companies that have yielded to the union, macher. There is no doubt now that the strike will, eventually be broken, but it will have driven many of the best men out of the camp and the labor will be of even a worse character than formerly and the camp has never been noted for the efficiency of its miners. To break the strike hundreds of men will have to be brought in, and it is not to be expected that they will be of a high-grade of efficiency.

The high-grade action of the Thiel detectives in shooting at some of the strikers is to be deplored for many reasons. In the first place, it put new enthusiasm into a waning cause and will no doubt occasion the prolongation of the strike; and, in the second place, it embittered the controversy. There is doubt that the Thiel's were needed for the protection of the mining property, but their swaggering through the public places with a chip on their shoulders invited trouble. None of the men shot were seriously hurt, and the nature of the wounds suggests that the men were careful not to shoot their opponents in any vital part. Too late in the day the Provincial Government decided to take over the situation themselves, and immediately they showed real determination to stop interference with those who desired to work, the danger of rioting was over. Previously strikers had pulled strike-breakers who were being imported from the trains, and only 18 of 138 men who were being brought in actually reached the mine. On the first occasion, when the Provincial police were in full charge of the situation, there was not the slightest trouble, and all the men won through safely.

The Ryan Discovery.—A find which promises to be of some importance has at last been made on the Gillies

Limit claims which were staked with so much farvour in August. On the Ryan claim a wide vein of cobalt and nicolite has been followed for the past month. In it has now been found good silver values.

Ore on Silver Bar.—A little high-grade ore has been found in a vein on the Silver Bar, all that is left of the Preston East Dome Mining Company. At the 50-foot level the smaltite vein which was being followed was being raised on, and almost at once four or five inches of high-grade ore was exposed. The conglomerate here is but sixty feet deep, so that it is not probable that the find is of any great importance.

Good News From Cobalt Lake.—The Cobalt Lake will make pay its first dividend on Jan. 2. The company does not commit itself to any regular disbursement of profits, but payments will be made as they accumulate. The dividend calls for $75,000, or two and a half per cent. on $3,000,000. The capital of the Cobalt Lake was originally $5,000,000, but the directors have been retiring the stock for the last two years. At the height of the Cobalt boom the company gave the Government $1,000,000 for Cobalt Lake. This was in 1906, and up to last year there appeared very little probability that the shareholders would ever profit. The necessity of proceeding with extreme caution in mining under the lake, and the expense occasioned by tapping the bottom of the lake at two different points has made the management of the property one of the most thankless in camp. The first ore was found close to the McKinley-Darragh boundary, and it was only last year that another ore body was opened up along the big fault running the length of the lake. It is probable that the bulk of the ore sold to make the first dividend came from this new ore body.

There is now a very general agitation for the repeal of royalties on claims in the Gillies Limit purchased from the Ontario Government. These are subject to a 25 per cent. gross royalty, which, in the case of a poor and struggling producer, skims all the cream off the profits. The Provincial, which has just been able to make ends meet, has already paid $9,000 to the Government, though it is now not making expenses.

STATISTICS AND RETURNS

DOMINION COAL OUTPUT

The output of the Dominion Coal Company for November was 400,000 tons. The company will have mined by the end of the year four and a half million tons.

COBALT ORE SHIPMENTS

The ore shipments for the week and year to date are as follows in tons:—

	Week Dec. 6.	Year to date.
Bailey	......	21.57
Beaver	......	63.75
Casey Cobalt	......	255.15
City of Cobalt	......	914.99
Buffalo	114.34	1,103.84
Cobalt Lake	100.15	961.03
Cobalt Townsite	......	1,729.02
Chambers-Ferland	......	427.83
Coniagas	123.57	1,997.90
Crown Reserve	20.02	437.84
Drummond	......	383.05
Hudson Bay	31.65	662.85
Kerr Lake	......	743.05
La Rose	60.00	3,291.09
Lost and Found	......	27.80
McKinley-Darragh	......	2,350.99
Nipissing	......	1,735.62
Penn-Canadian	......	97.90
O'Brien	......	325.43
Provincial	......	22.22
Right of Way	......	242.82
Temiskaming	43.85	958.66
Trethewey	......	504.89
Wettlaufer	30.25	437.21
Colonial	......	63.14
Dom. Red. Co.	......	56.64
Peterson Lake (Seneca Superior)	32.26	227.89
Totals	616.12	20,681.79

The bullion shipments for the week are much higher than of late, totalling 150,000 ounces from four mines. A Buffalo shipment of 33,000 ounces was made, the first run from their new high grade mill.

The week's bullion record is:

	Ounces.	Value.
Nipissing	100,903.42	$64,452.00
Buffalo	33,154.00	21,000.00
Crown Reserve	14,599.90	8,500.00
Cobalt Townsite	2,300.00	1,495.00
Total	150,957.32	$95,447.00

The year's bullion shipments to date are as follows:

	Ounces.	Value.
Nipissing	3,717,029.55	$2,262,176.85
Crown Reserve	442,118.37	251,114.11
Temiskaming	38,782.00	23,165.10
O'Brien	206,792.94	124,323.61
Nova Scotia	49,010.00	31,800.00
Buffalo	115,311.00	69,914.54
McKinley-Darragh	80,327.00	6,069.37
Kerr Lake	21,463.19	13,081.95
Trethewey	20,637.08	12,416.16
City of Cobalt	5,659.94	3,133.20
Colonial	1,698.00	1,018.00
La Rose	69,849.00	41,030.88
Wettlaufer	3,280.62	2,003.14
Cobalt Lake	5,256.88	2,989.75
Right of Way	505.50	273.00
Cobalt Townsite	8,582.55	5,362.00
Drummond	3,513.54	2,169.42
Casey Cobalt	940.00	574.00
Dom. Red. Co.	75,972.46	46,760.03
Miscellaneous	16,672.56	11,050.14
Bailey	14,050.50	8,816.65
Penn-Canadian	445.00	282.69
Totals	4,887,805.33	$2,918,436.59

B. C. ORE SHIPMENTS

For the week ending November 30th the total output of the mines of the Kootenay and Boundary districts was 49,894 tons; for the year to date the total is 2,313,336 tons. Smelter receipts for the week were 43,394 tons and for the year, 2,266,211 tons. Output in detail was:

Nelson.

Mother Lode, milled	500	13,750
Queen, milled	400	13,300

Granite Poorman, milled	250	12,850
Molly Gibson, milled	300	8,100
Second Relief	250	5,750
Yankee Girl	142	385
Other mines	.	9,943
Total	1,842	64,078

East Kootenay.

Monarch, milled	425	11,650
Sullivan	1,417	27,855
St. Eugene	31	603
Other mines	...	1,579
Total	1,873	41,687

Slocan and Ainsworth.

Zinc shipments	630	8,177
Standard, milled	400	16,800
Van Roi, milled	1,100	53,600
Bluebell, milled	200	3,900
Silver Heart	28	182
Ruth	38	547
Utica	40	819
Van-Roi	31	2,132
Standard	42	7,895
Other mines	...	19,410
Total	2,509	109,462

Rossland.

Le Roi No. 2, milled	300	9,200
Inland Empire, milled	90	1,980
Le Roi	494	41,947
Centre Star	2,621	145,692
Le Roi No. 2	437	23,692
Other mines	...	281
Total	3,942	222,792

Boundary.

Surprise	106	5,272
Knob Hill	105	1,981
Nickle Plate, milled	1,500	70,100
Jewel, milled	200	3,200
Mother Lode	6,692	340,153
Granby	25,153	1,160,620
Unnamed	262	10,904
Rawhide	5,009	231,623
Napoleon	543	12,070
Ben Hur	137	274
Clugston	21	21
Other mines	...	29,102
Total	39,728	1,865,317

Zinc Shipments.

Lucky Jim	120	2,267
Standard	480	3,455
Van Roi	30	2,261
Other mines	...	194
Total	630	8,177

SHARE MARKETS

TORONTO MARKETS.

Dec. 10—(Quotations from Canada Metal Co., Toronto).

Spelter, 6.35 cents per lb.
Lead, 5 cents per lb.
Tin, 52 cents per lb.
Antimony, 11 cents per lb.
Copper, casting, 18½ cents per lb.
Electrolytic, 18½ cents per lb.
Ingot brass, 11 to 15 cents per lb.

Dec. 10—Pig Iron (Qutations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $23.00 (f.o.b. Toronto).
Midland No. 2, $22.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to ..6.75 per ton.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

Coke.

Dec. 6—Connellsville Coke (f.o.b. ovens)—

Furnace coke, prompt, $4.00 per ton.
Foundry coke, prompt, $4.00 to $4.50 per ton.

Dec. 6—Tin, Straits, 49.30 cents.

Copper, Prime Lake, 17.55 to 17.65 cents.
Electrolytic copper, 17.40 to 17.50 cents.
Copper wire, 19.00 cents.
Lead, 4.35 cents.
Spelter, 7.37½ cents.
Sheet zinc (f.o.b. smelter), 9.00 cents.
Antimony, Cookson's, 10.15 to 10.25 cents.
Aluminium, 26.25 to 26.75 cents.
Nickel, 45.00 cents.
Platinum, ordinary, $45.50 per ounce.
Platinum, hard, $48.00 per ounce.
Bismuth, $2.00 to $2.25 per pound.
Quicksilver, $41.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
November 23	63	29⅛
" 25	63	29⅛
" 26	63	29⅛
" 27	63	29⅛
" 28	..	29⅛
" 29	63⅛	29 3/16
" 30	63½	29⅜
December 2	63⅞	29 9/16
" 3	64⅛	29 11/16
" 4	63⅝	29 7/16
" 5	64	29⅝
" 6	63⅞	29 9/16

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assaye. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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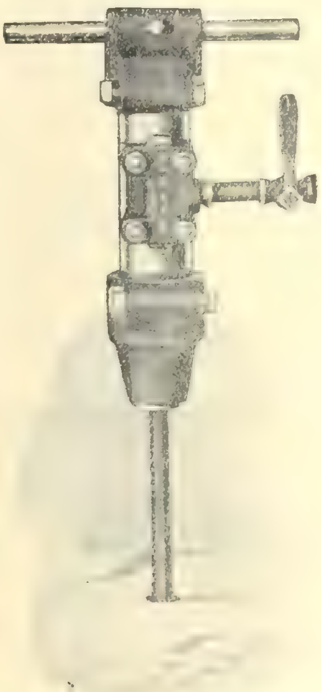

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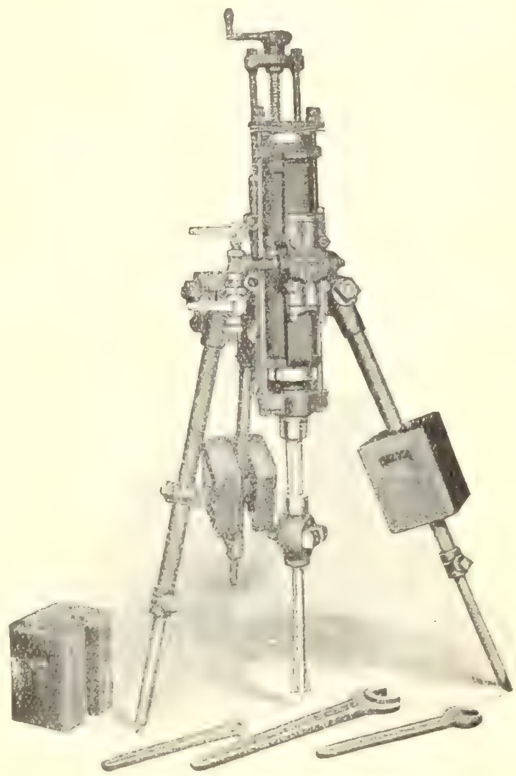

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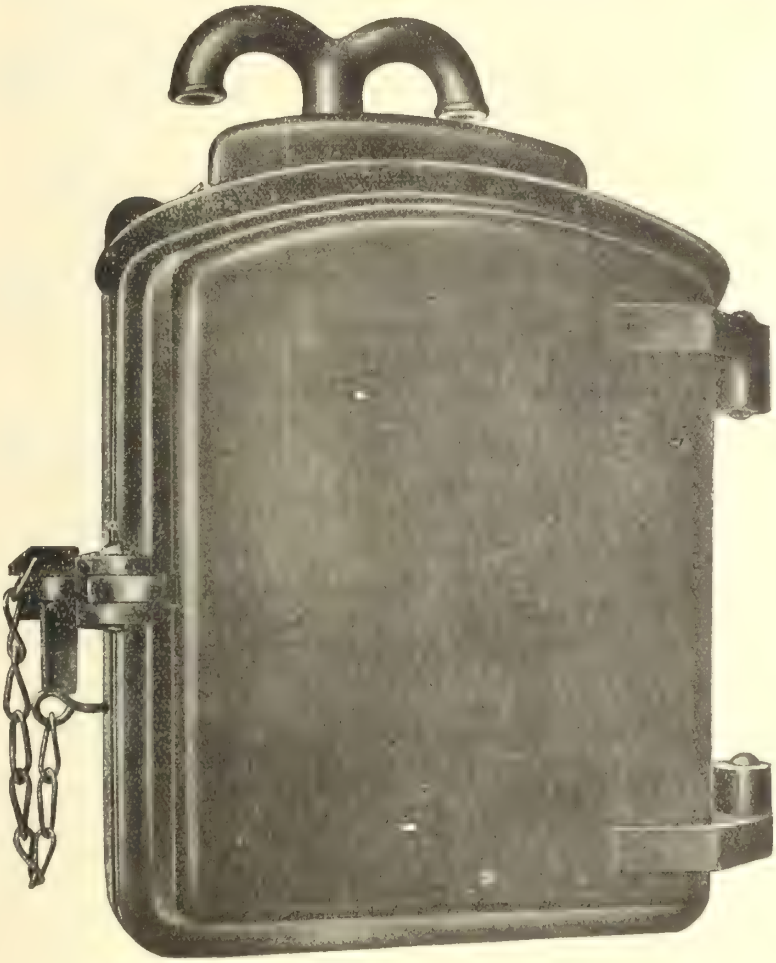

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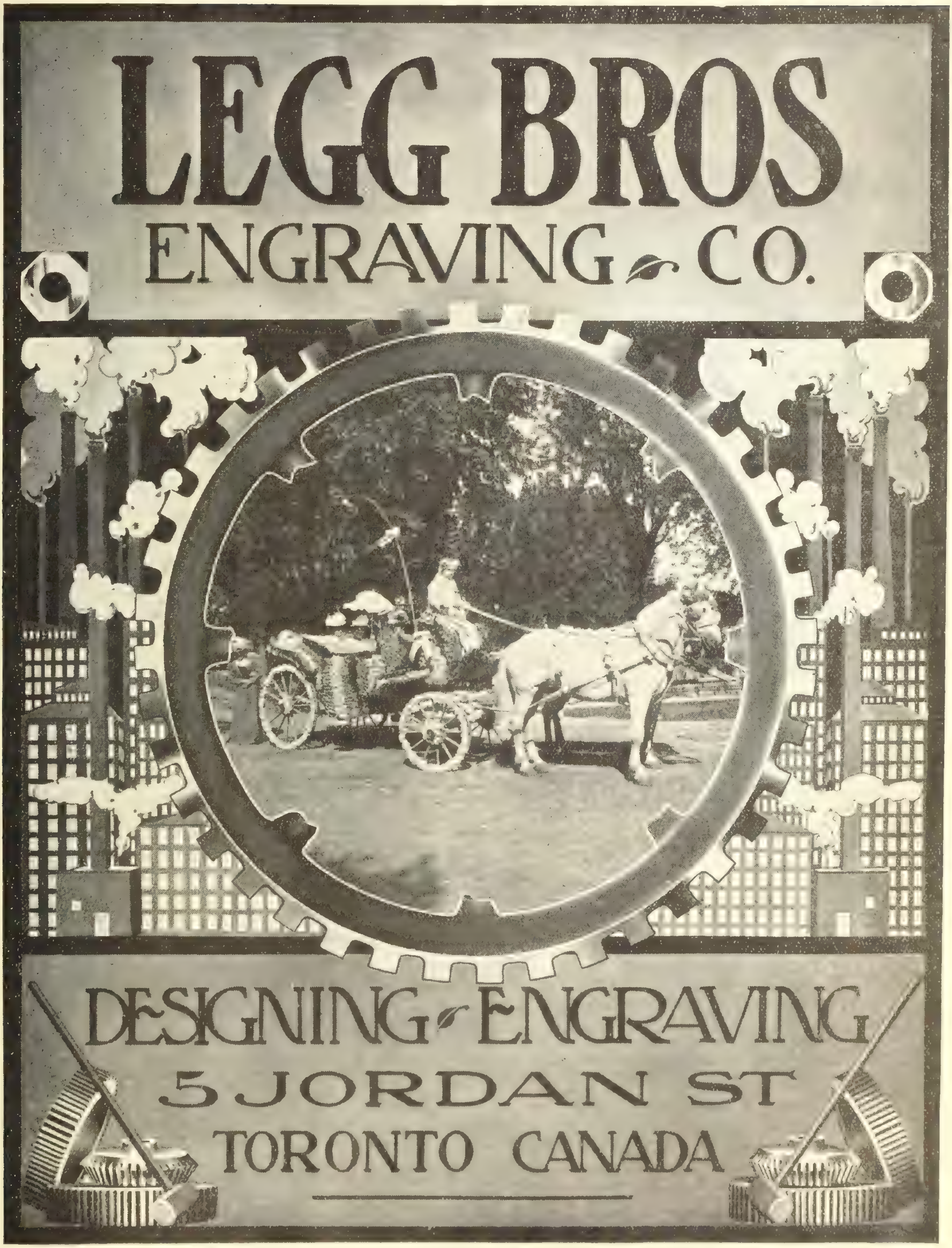
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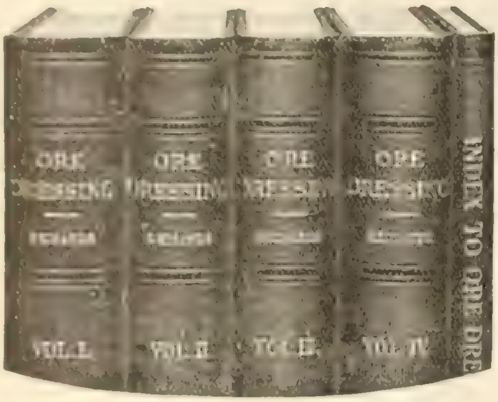

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